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Cho

(10) **Patent No.: US 10,512,379 B2**
(45) **Date of Patent: Dec. 24, 2019**

(54) **CLEANER AND DUST SEPARATING DEVICE APPLYING THE SAME**

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(73) Assignee: **Samsung Electronics Co., Ltd.**, Suwon-si (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 128 days.

(21) Appl. No.: **15/502,465**

(22) PCT Filed: **Jul. 30, 2015**

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§ 371 (c)(1),
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PCT Pub. Date: **Feb. 11, 2016**

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Jan. 15, 2015 (KR) 10-2015-0007504

(51) **Int. Cl.**
B01D 46/10 (2006.01)
B01D 45/16 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***A47L 9/1691*** (2013.01); ***A47L 9/106*** (2013.01); ***A47L 9/165*** (2013.01); ***A47L 9/1625*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC B01D 59/00; B01D 50/00; B01D 45/16; B01D 46/10; B01D 50/002; A47L 9/1683;
(Continued)

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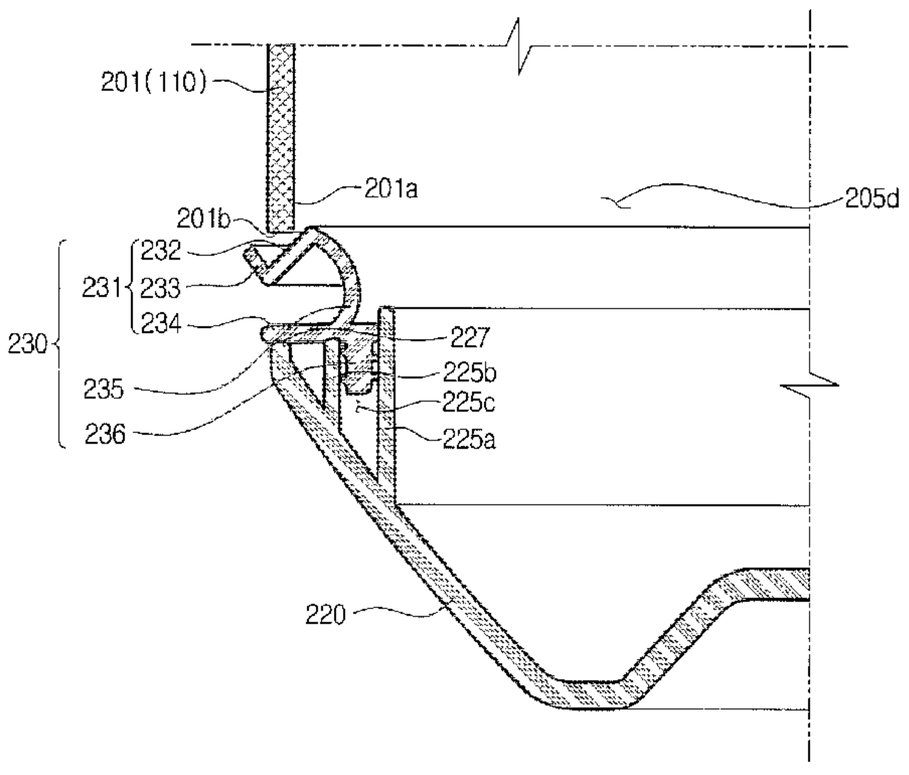
Primary Examiner — Minh Chau T Pham

(57) **ABSTRACT**

Provided is a cleaner including a dust collecting device for separating dust from air, wherein the dust collecting device includes a dust collecting case having a dust discharging port opened to discharge the collected dust; a discharge cover coupled to one side of the dust collecting case to open and close the dust discharge port; and a sealing member provided to extend from an inner surface of the dust collecting case to a coupling surface of the dust collecting case while being in contact with the dust collecting case and thus to be sealed when the dust discharging port is closed.

19 Claims, 31 Drawing Sheets



(51) **Int. Cl.**

A47L 9/16	(2006.01)
A47L 9/10	(2006.01)
B01D 50/00	(2006.01)

(52) **U.S. Cl.**

CPC ***A47L 9/1641*** (2013.01); ***A47L 9/1666*** (2013.01); ***A47L 9/1683*** (2013.01); ***B01D 45/16*** (2013.01); ***B01D 46/10*** (2013.01); ***B01D 50/002*** (2013.01)

(58) **Field of Classification Search**

CPC A47L 9/1608; A47L 9/127; A47L 9/1666; A47L 9/1633; A47L 9/1691; A47L 9/1625; A47L 9/106; A47L 9/165; A47L 9/1641

USPC ..... 55/429, 433, 502, DIG. 3; 15/350, 347, 15/352, 353, 300.1

See application file for complete search history.

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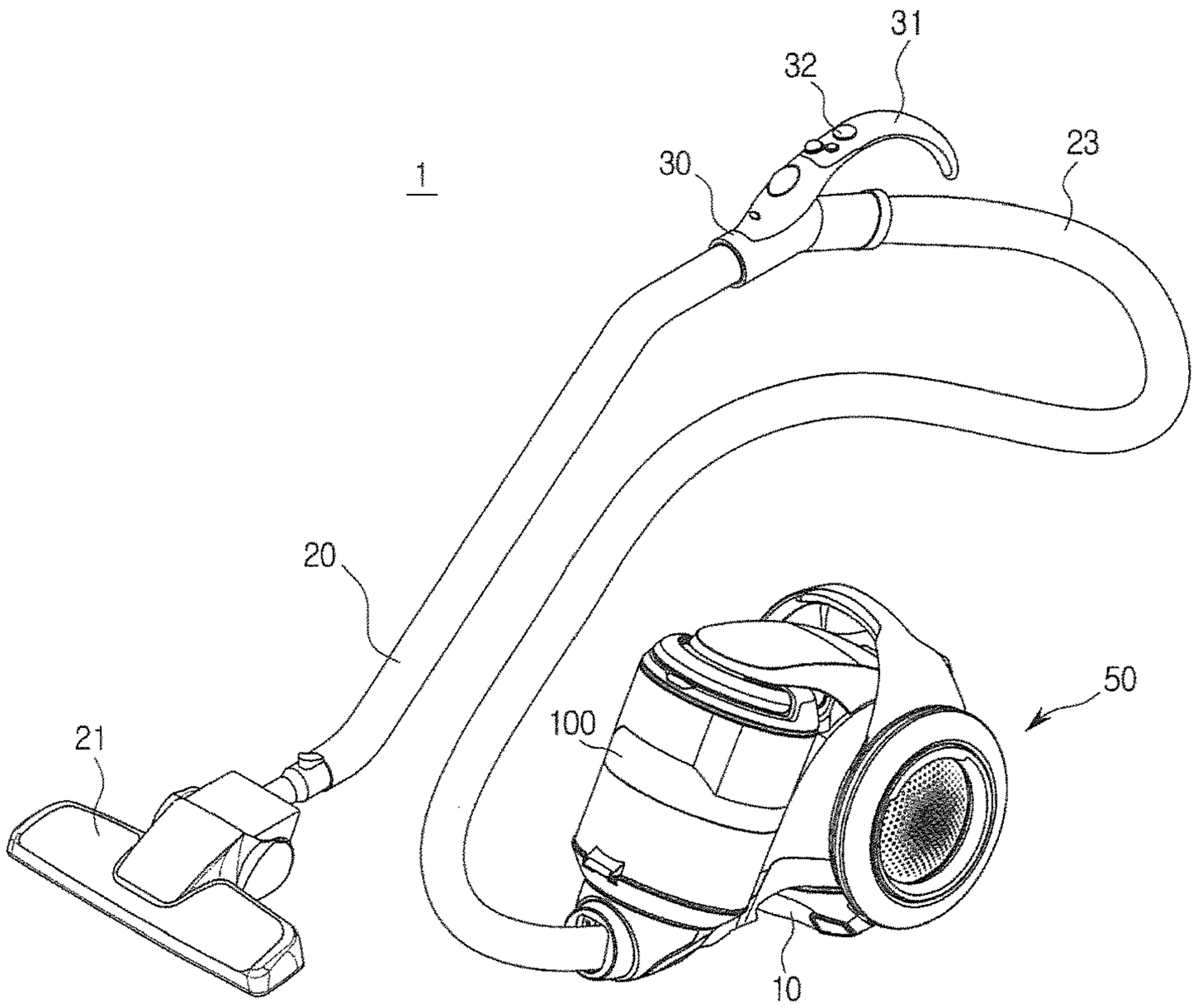
[Fig. 1]



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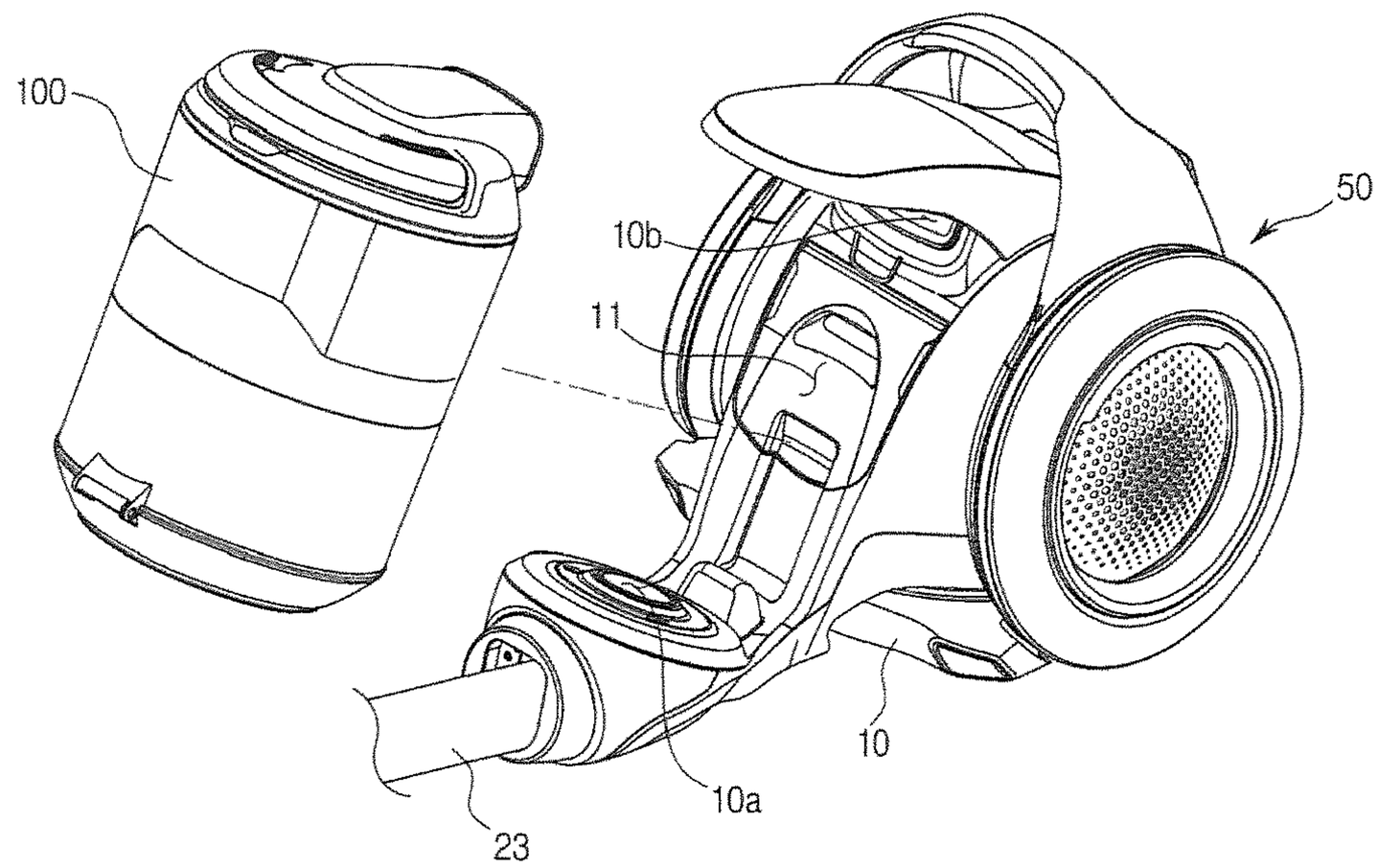

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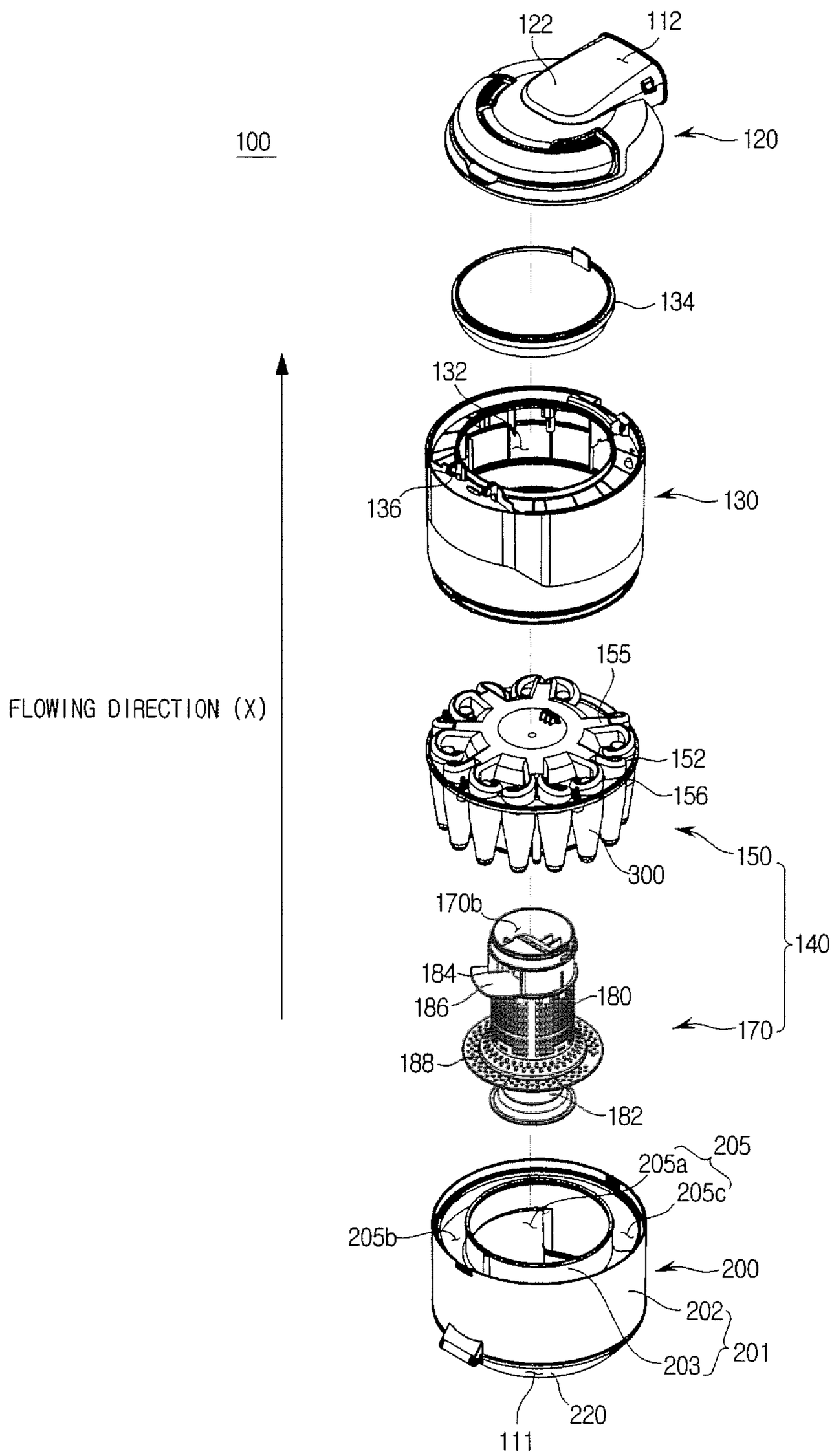
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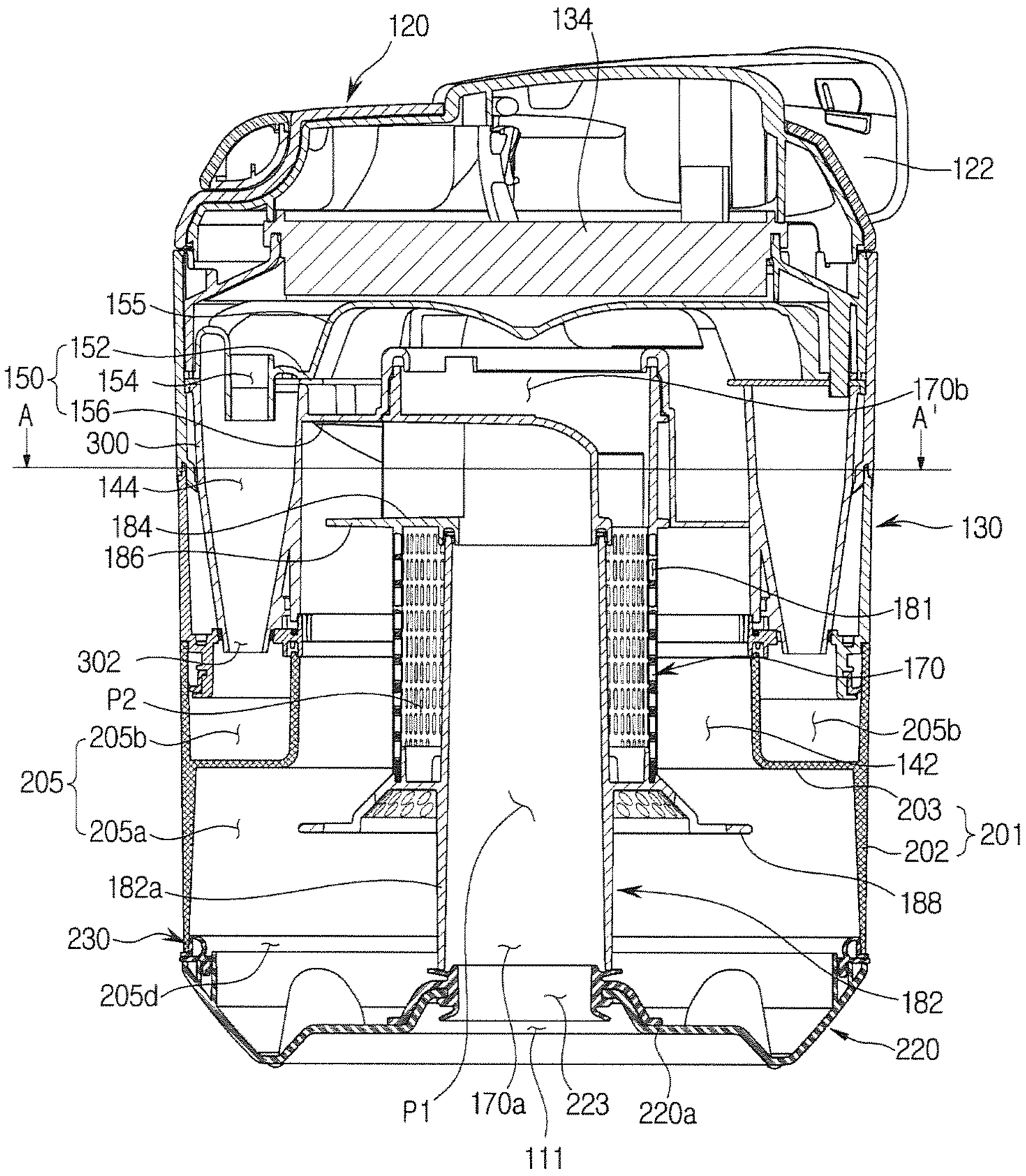
[Fig. 4]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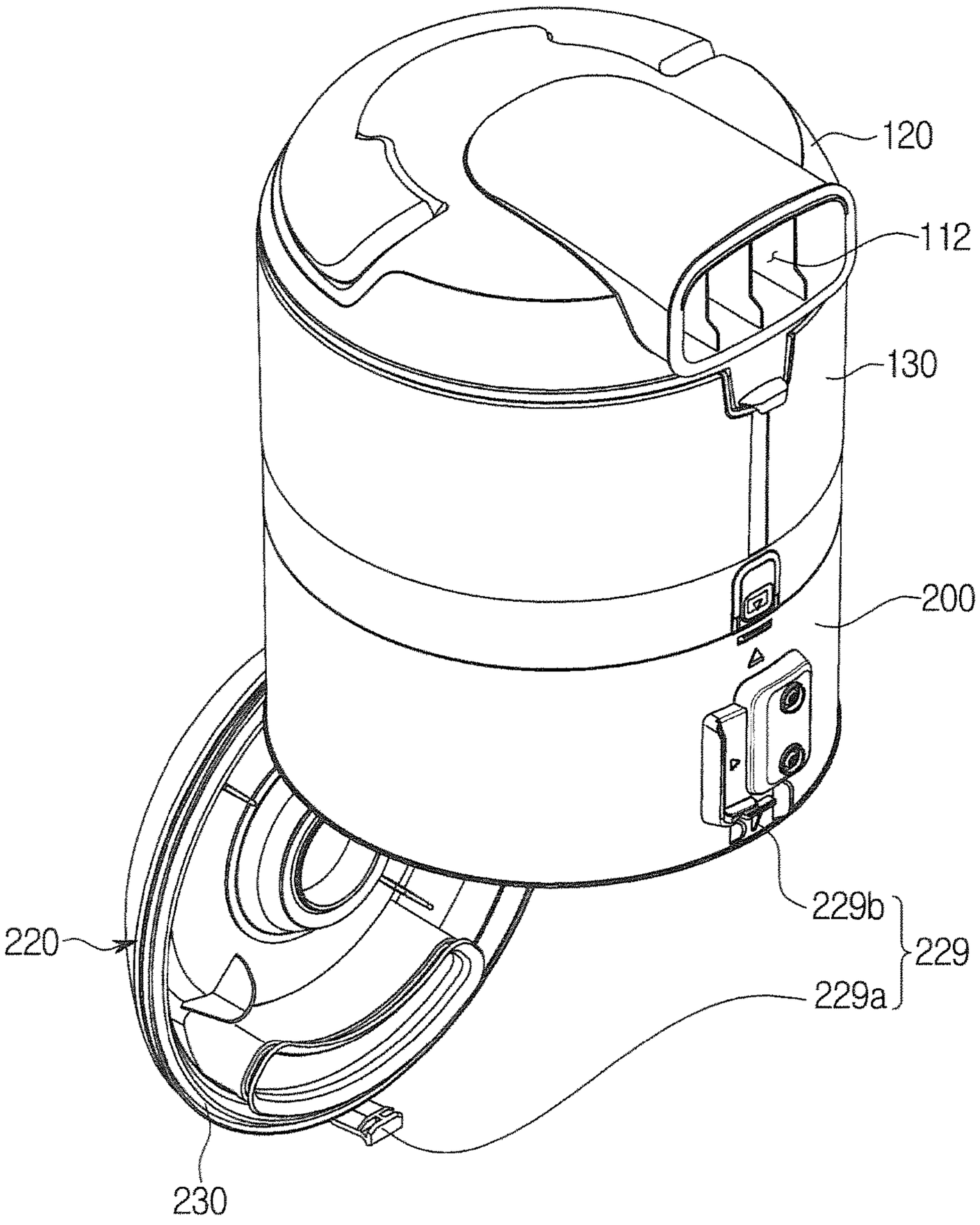
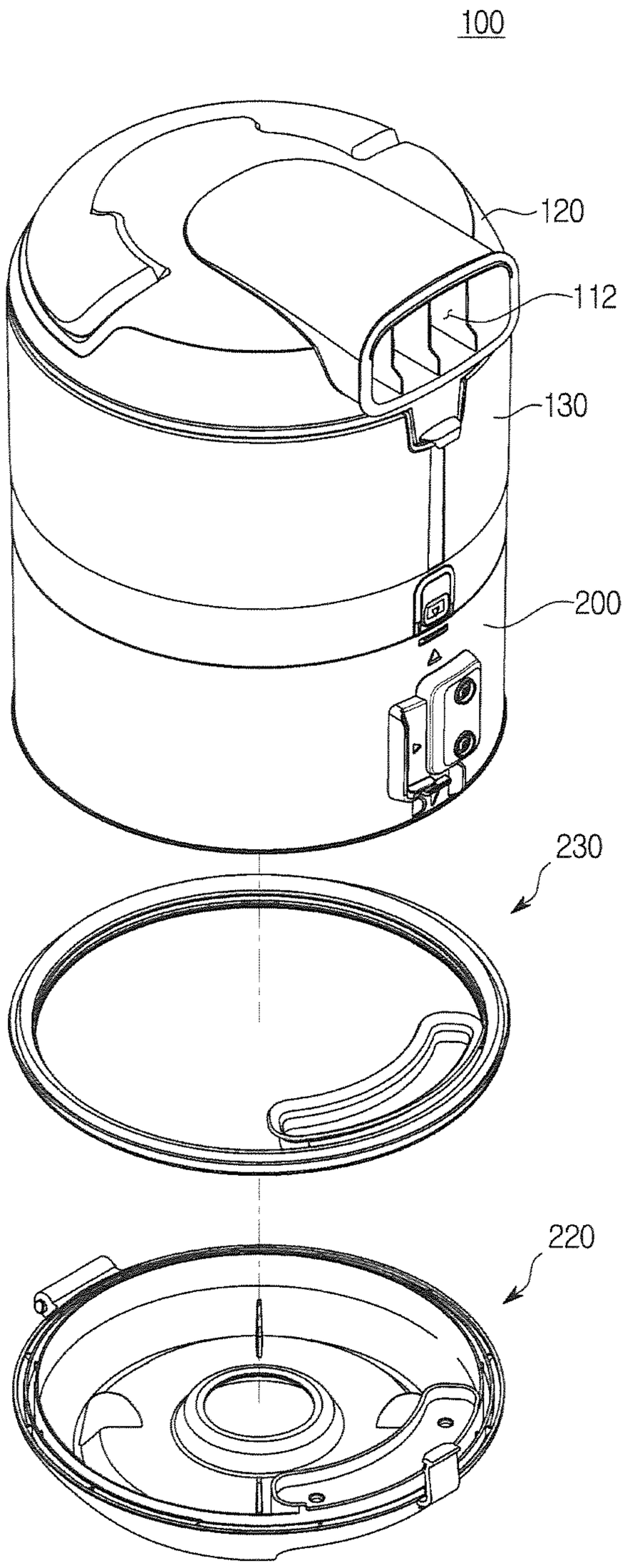
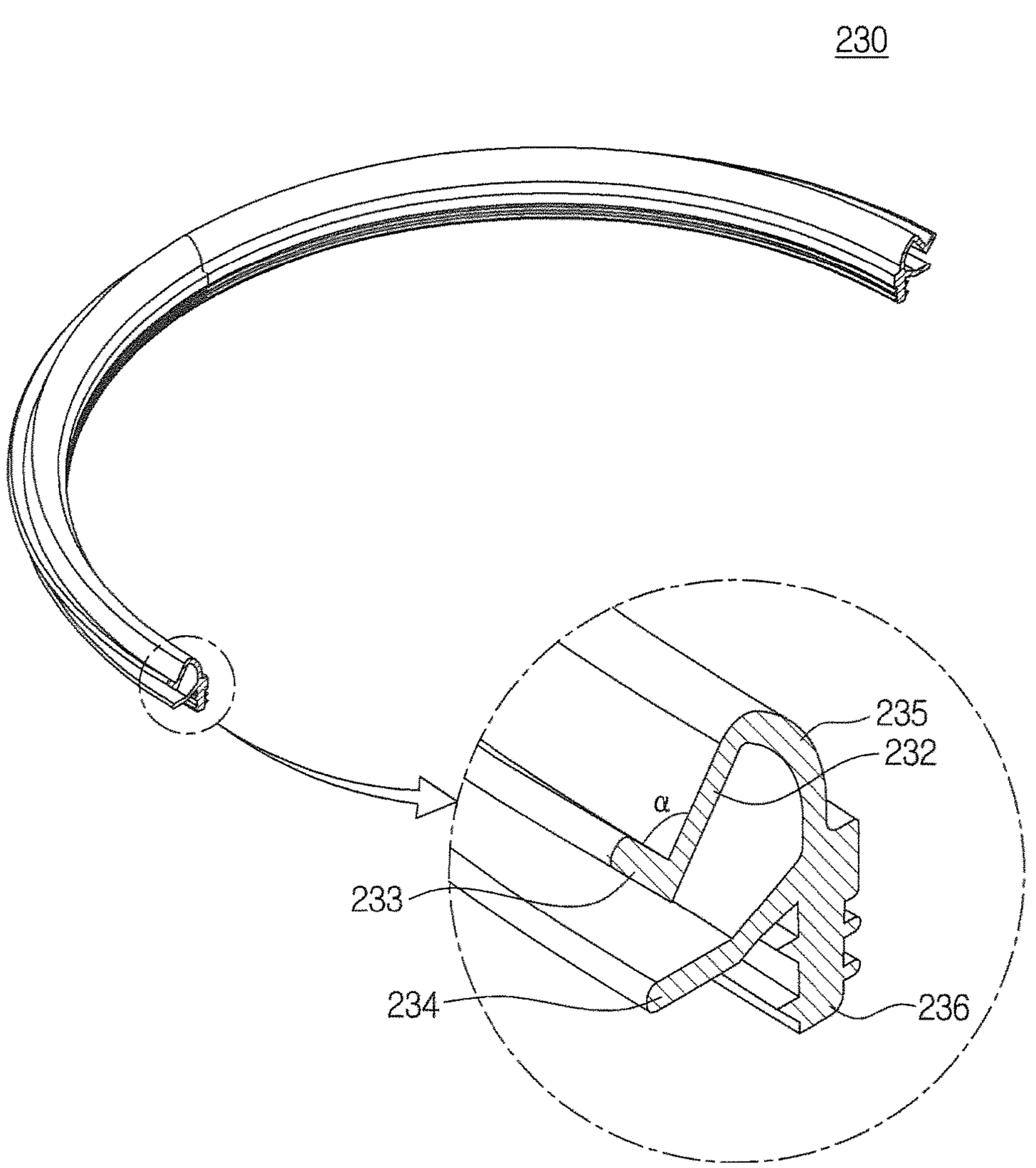
[Fig. 5]



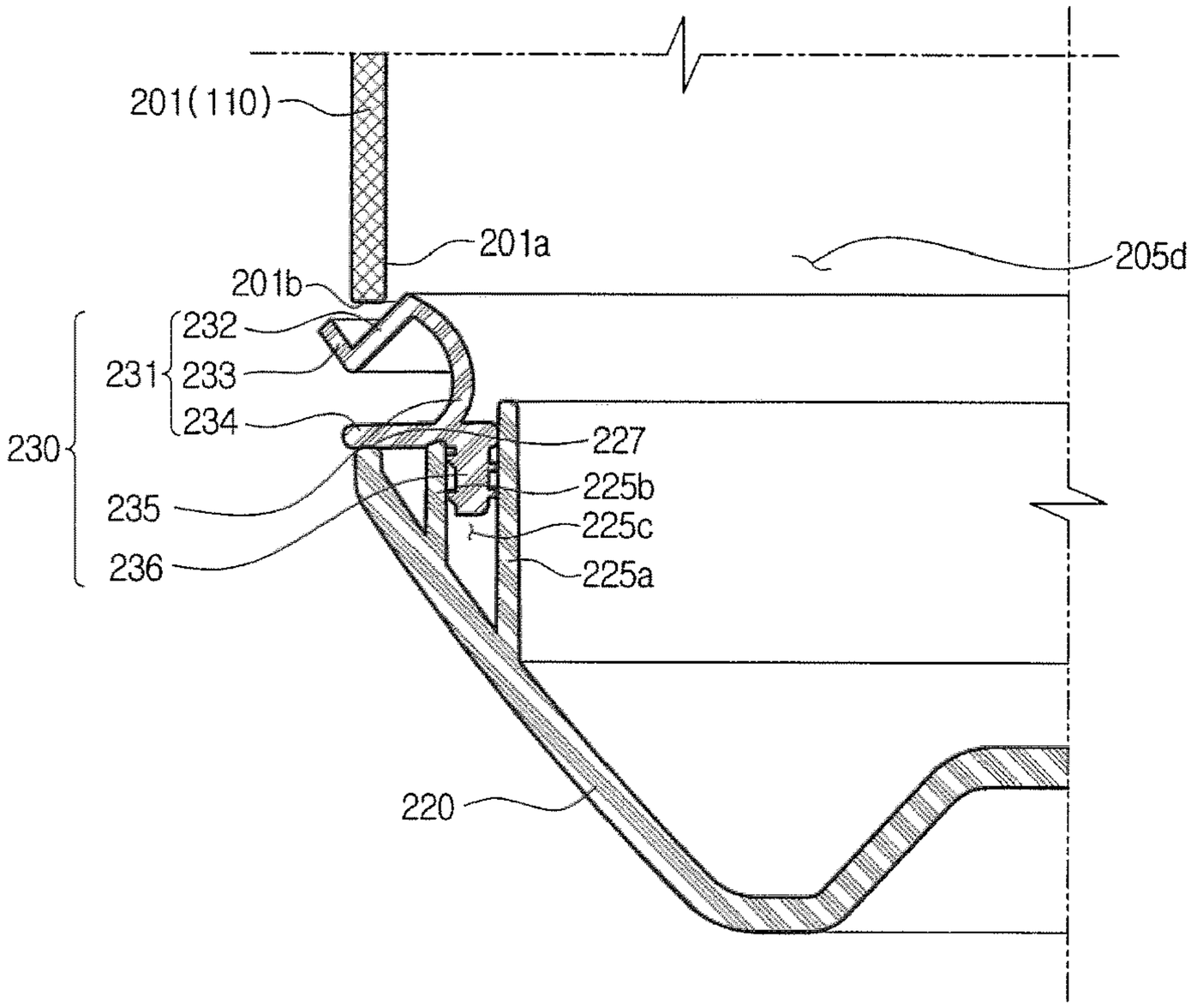
[Fig. 6]



[Fig. 7]



[Fig. 8]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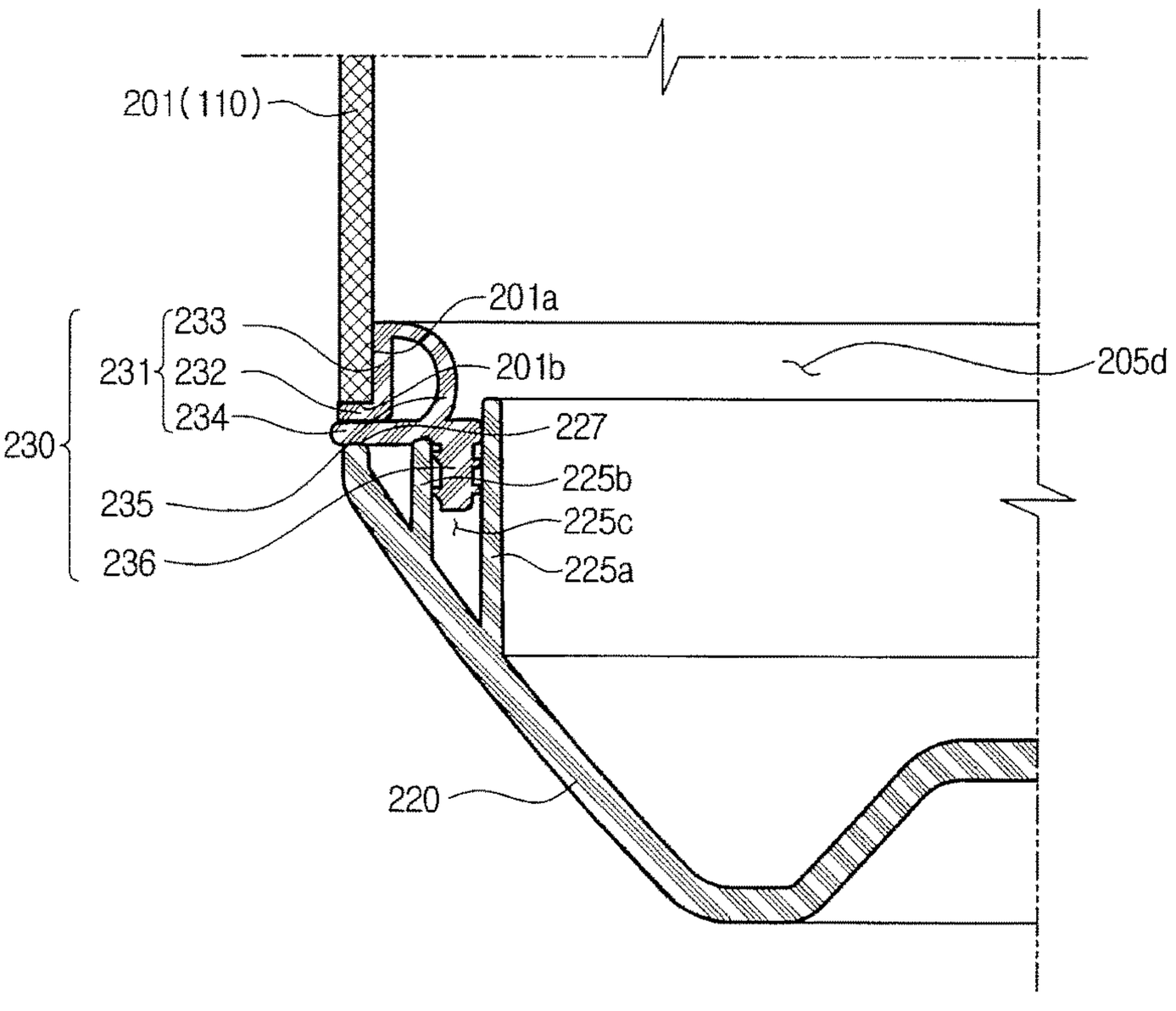
[Fig. 9]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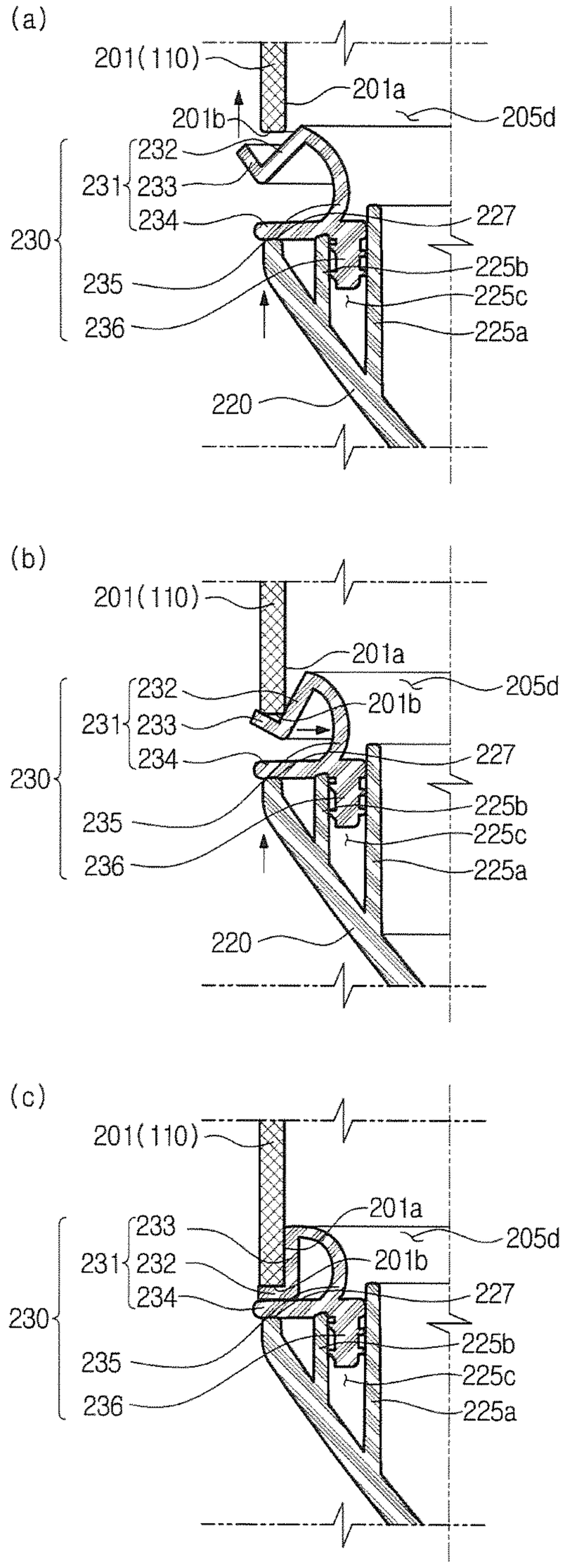
[Fig. 10]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(c)
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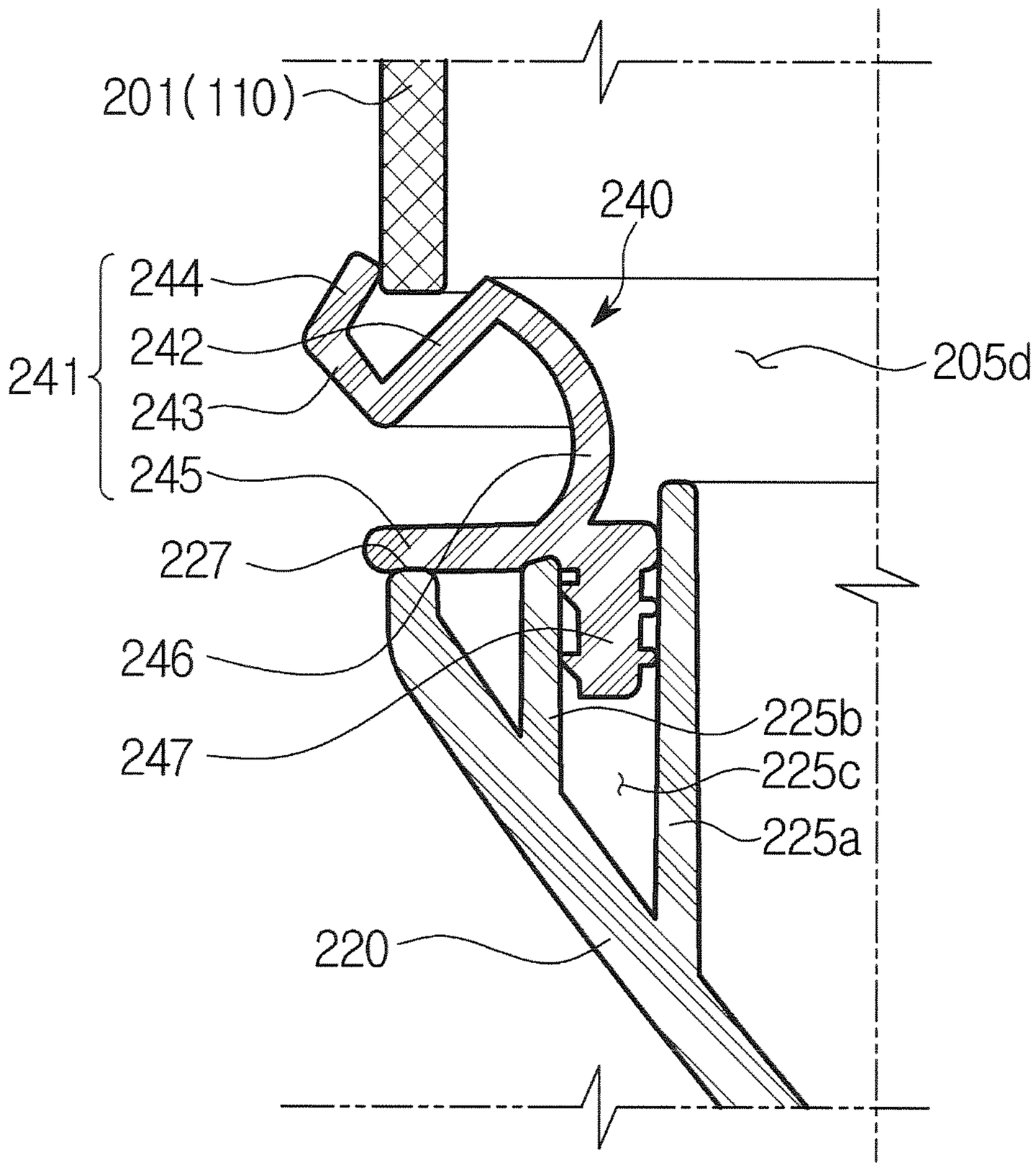
[Fig. 11]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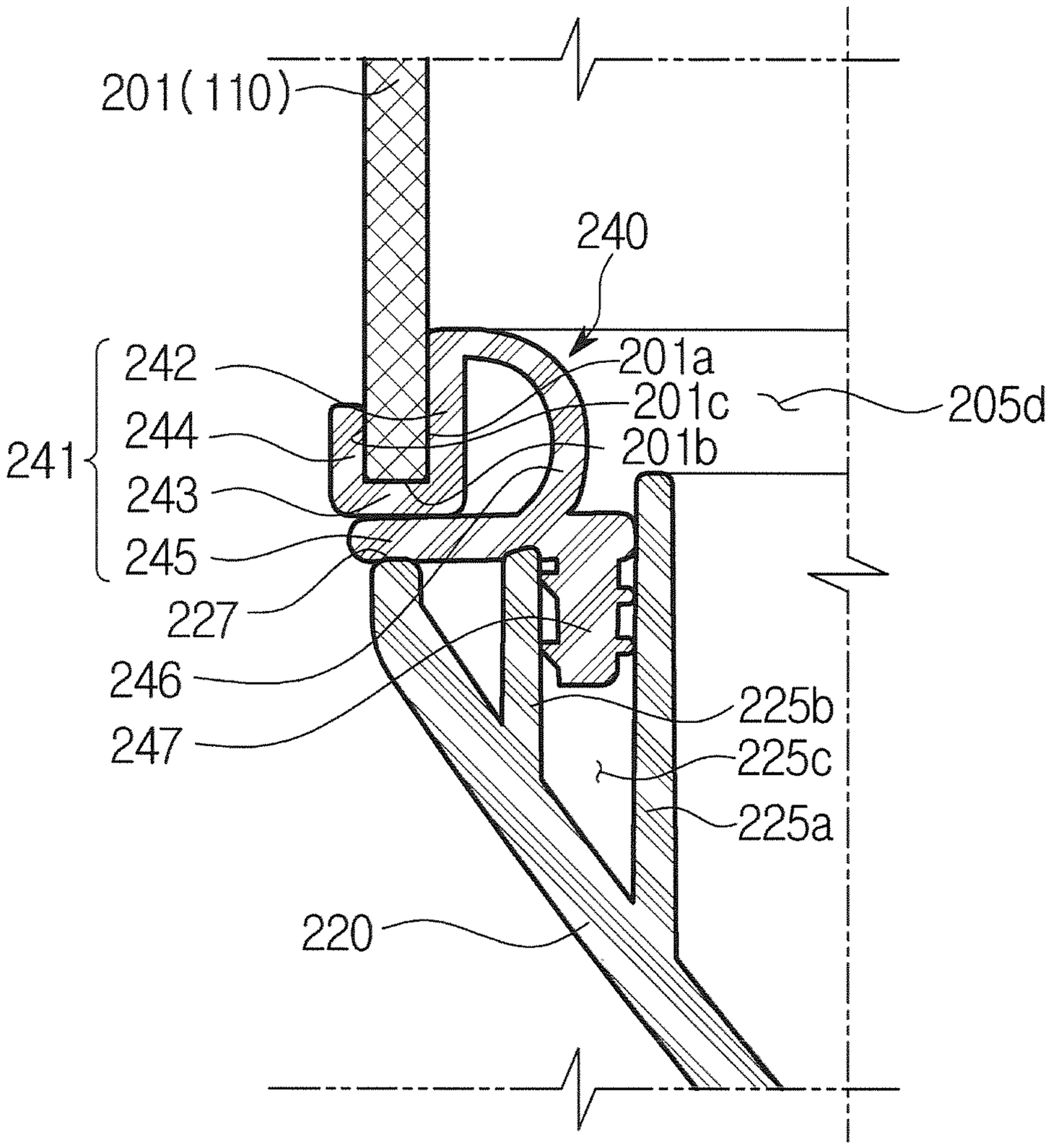
[Fig. 12]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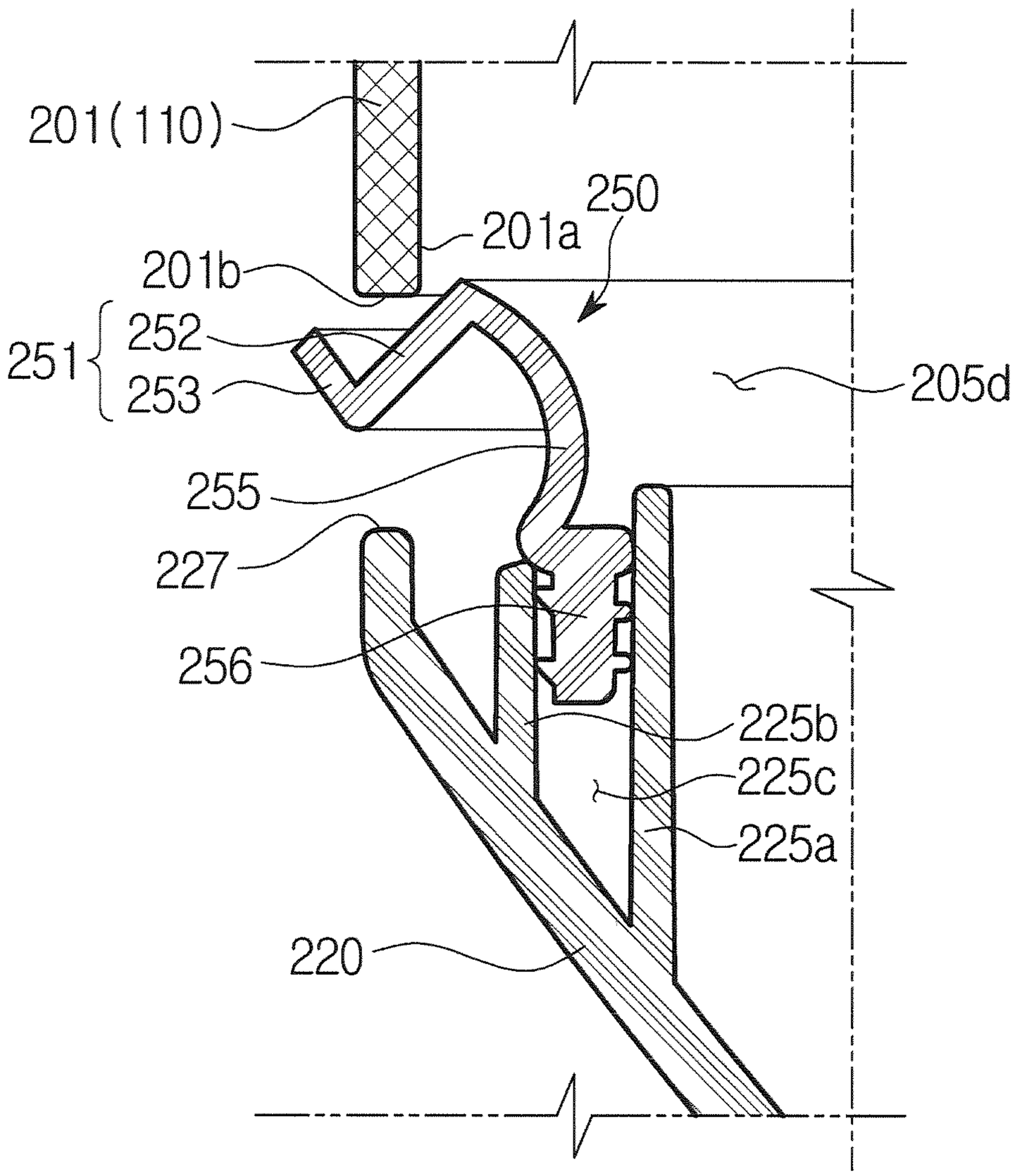
[Fig. 13]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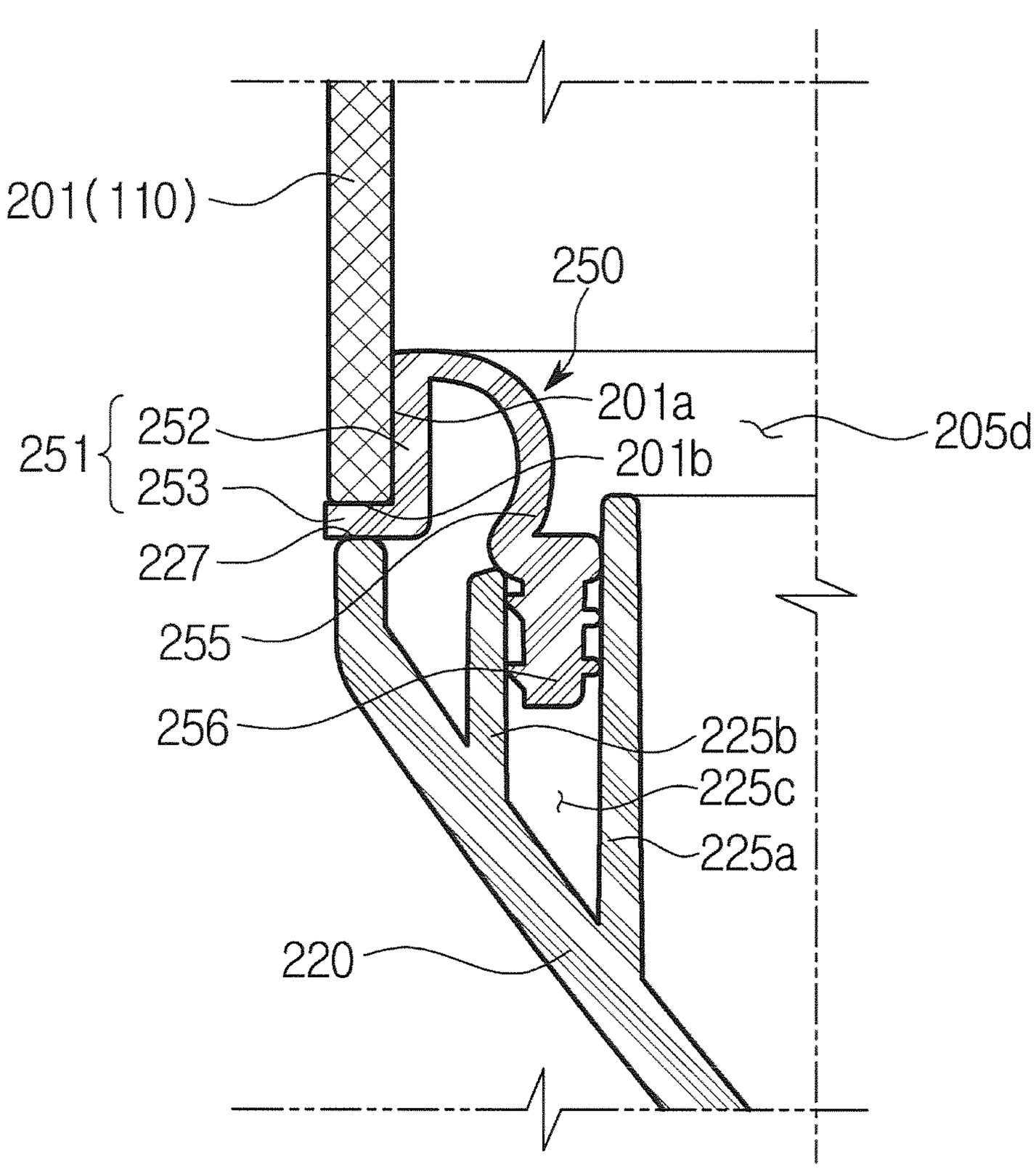
[Fig. 14]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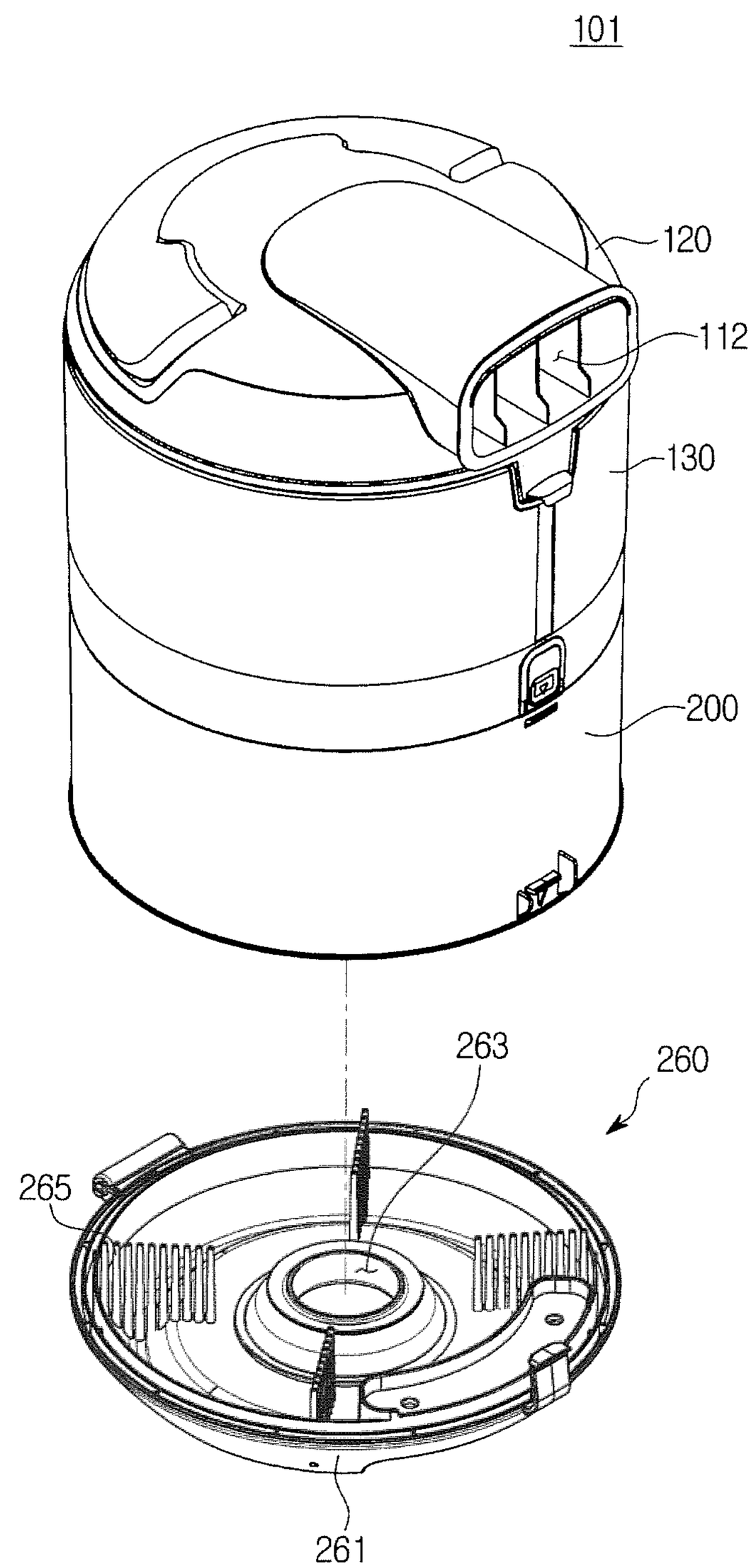
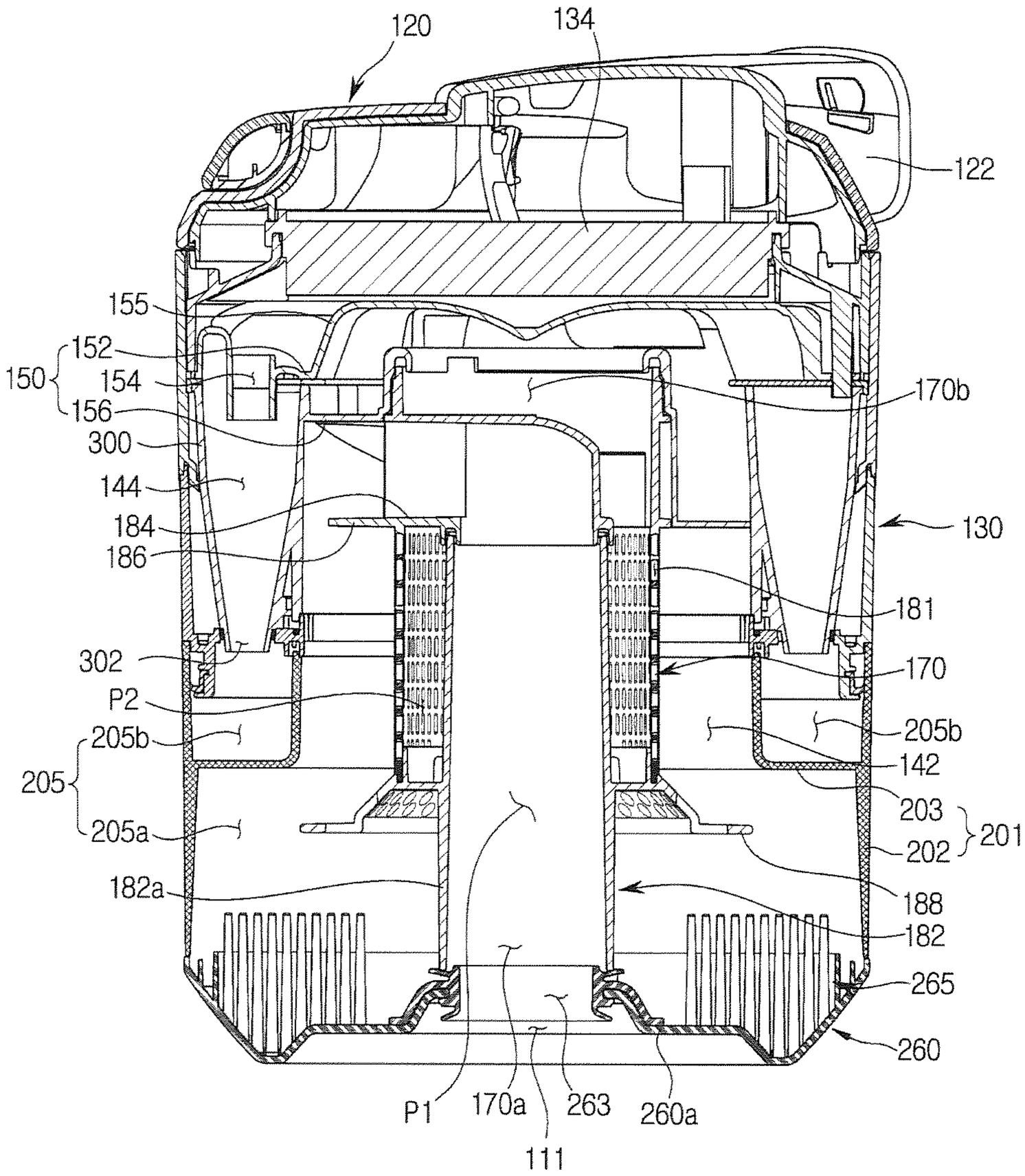
[Fig. 15]



[Fig. 16]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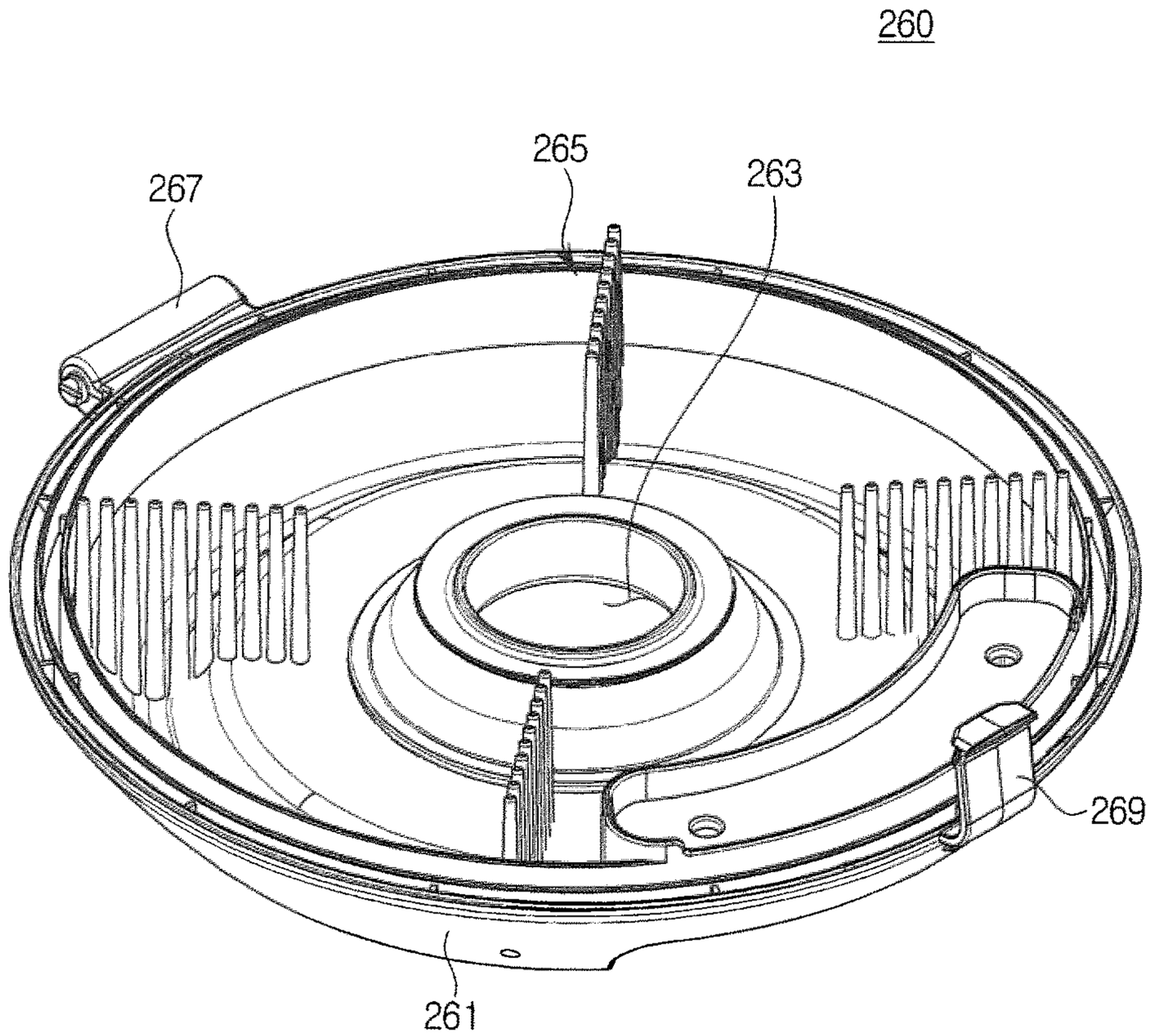
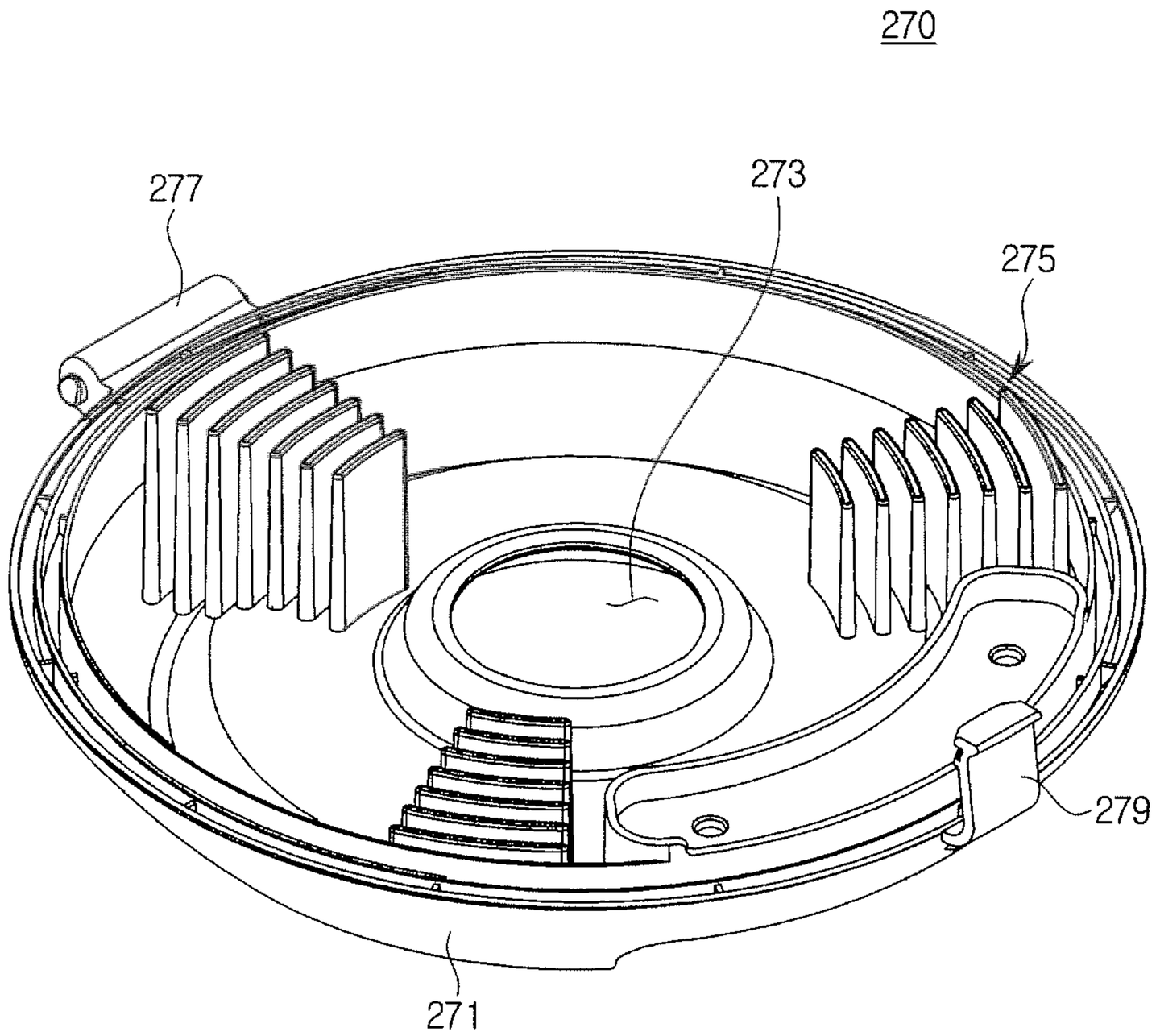
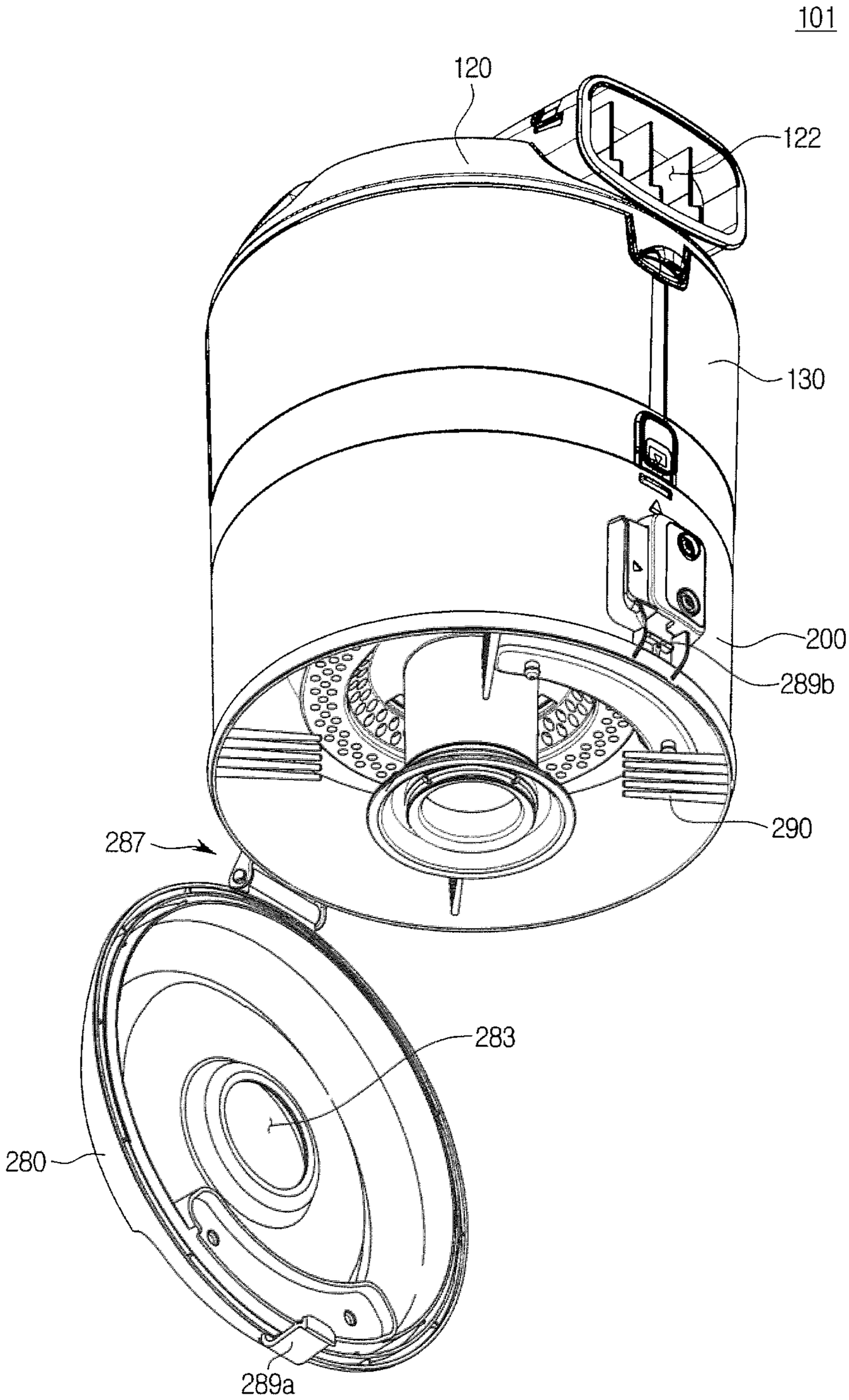
[Fig. 17]



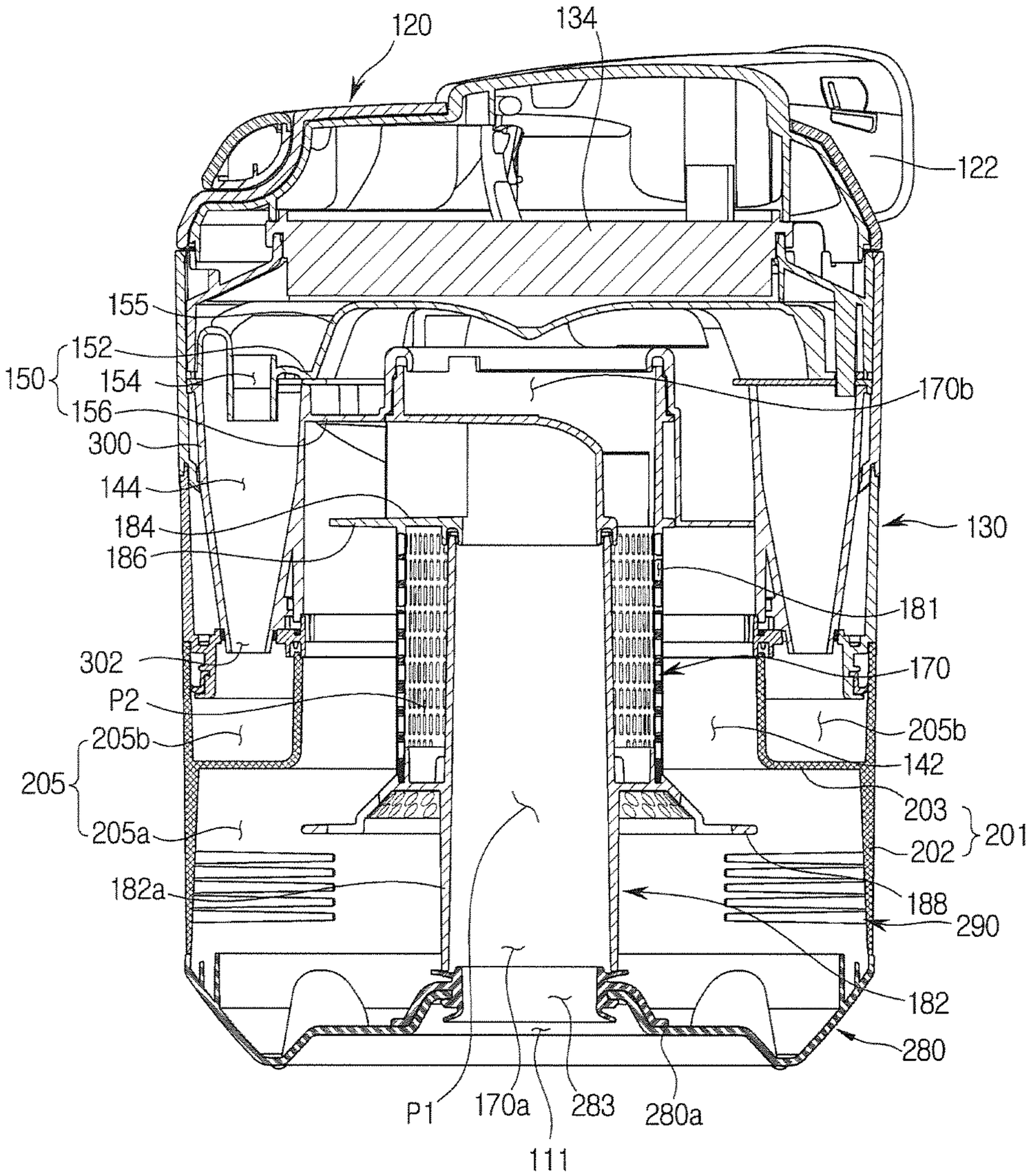
[Fig. 18]



[Fig. 19]



[Fig. 20]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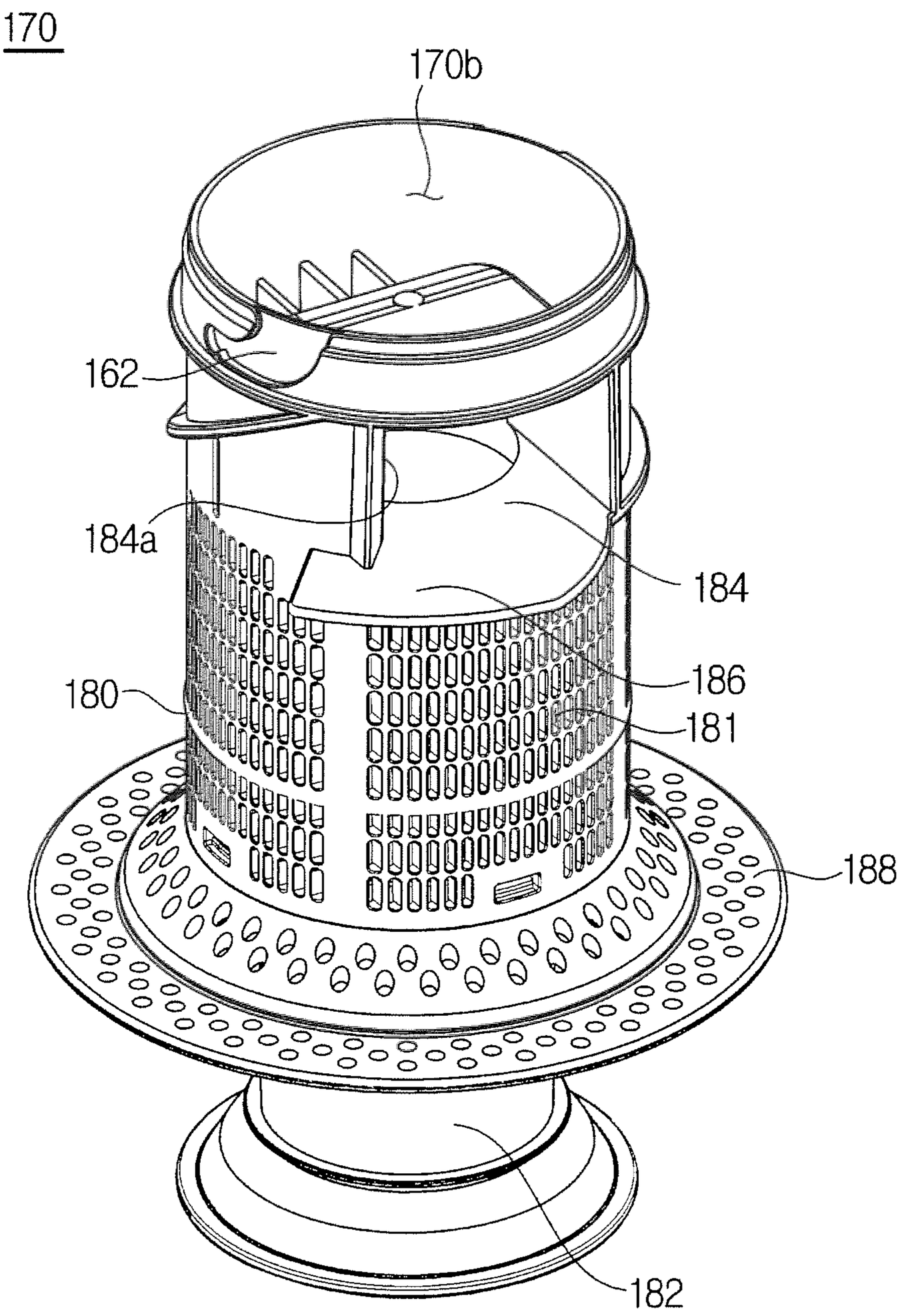
[Fig. 21]



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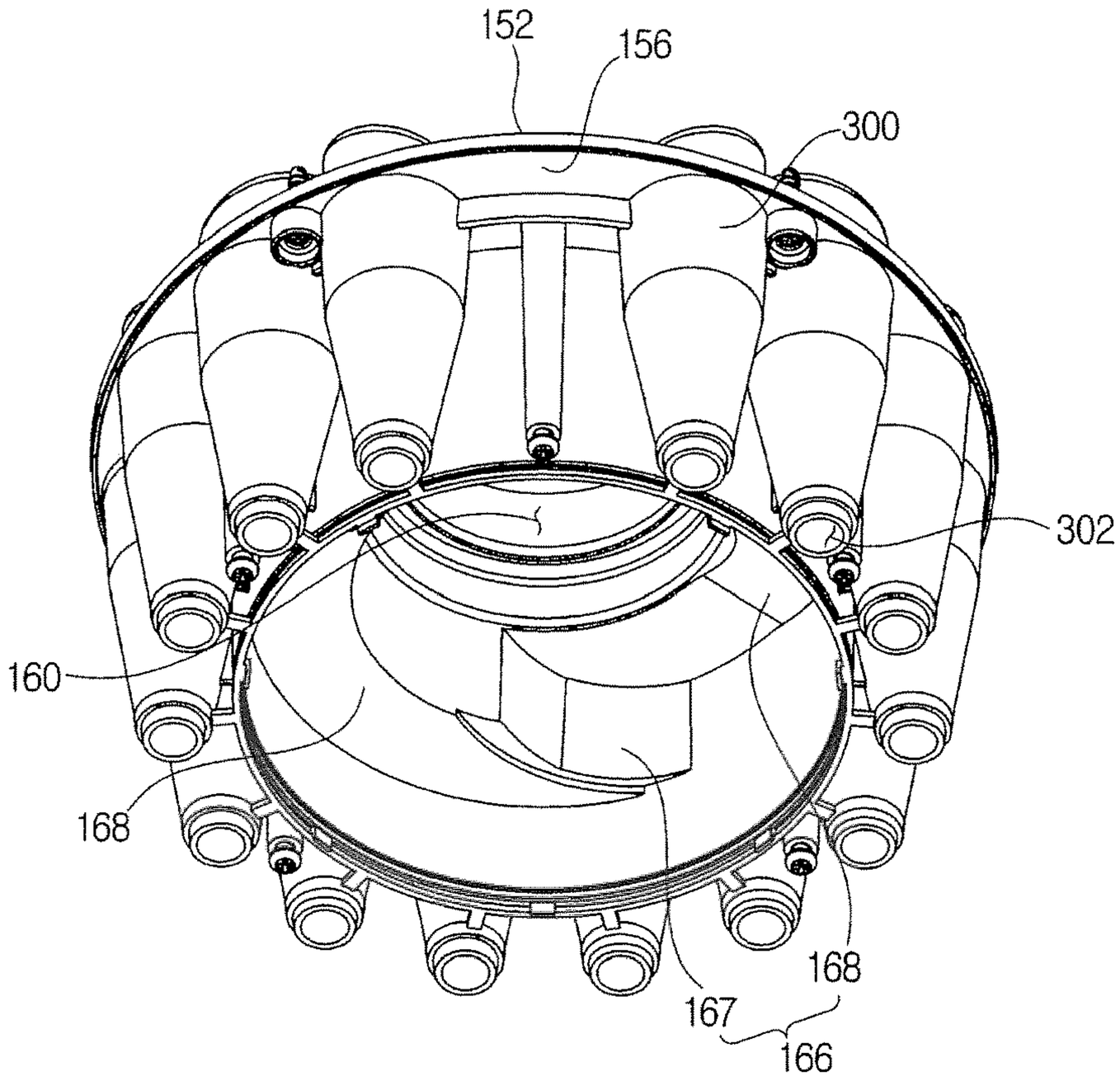
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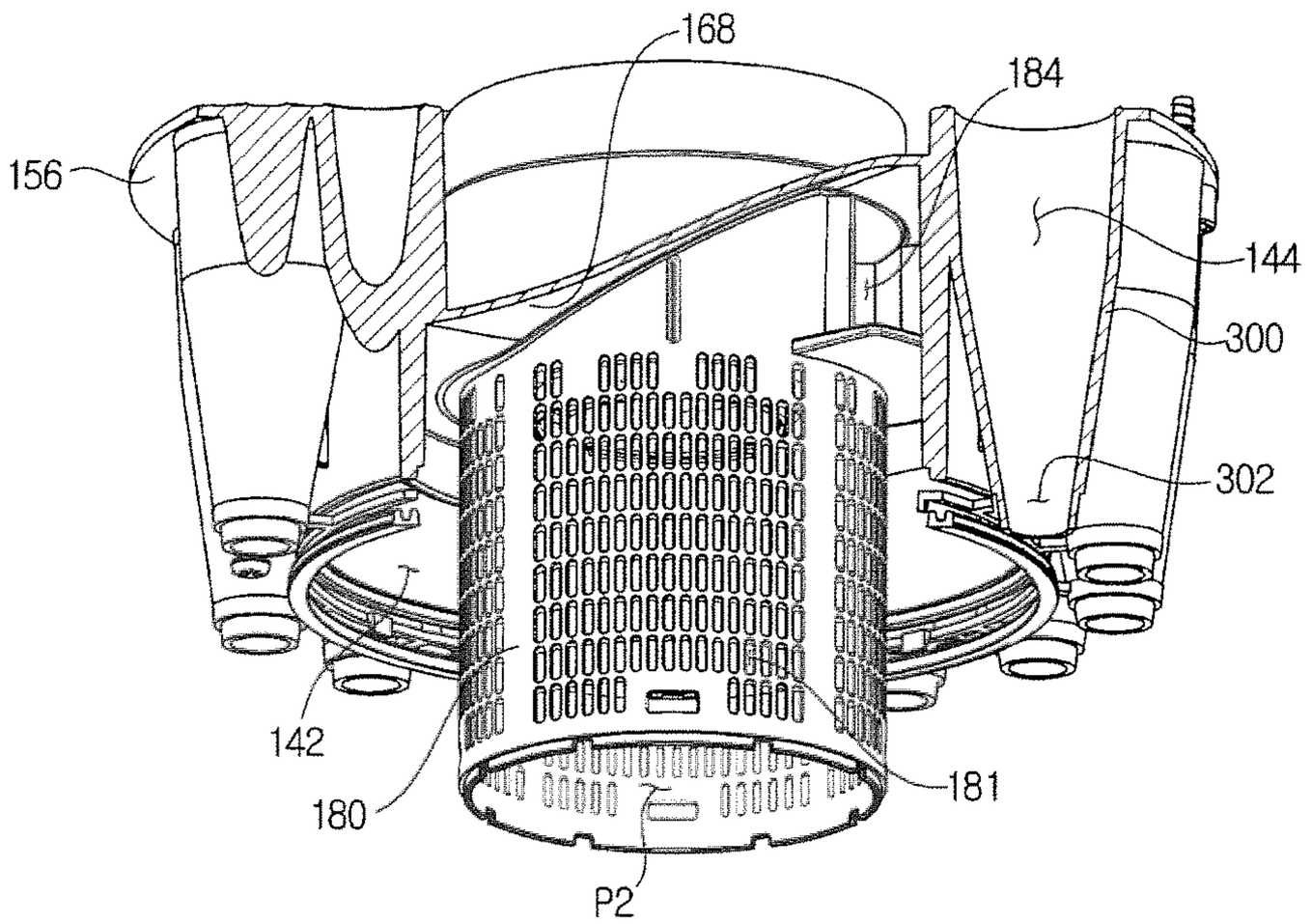
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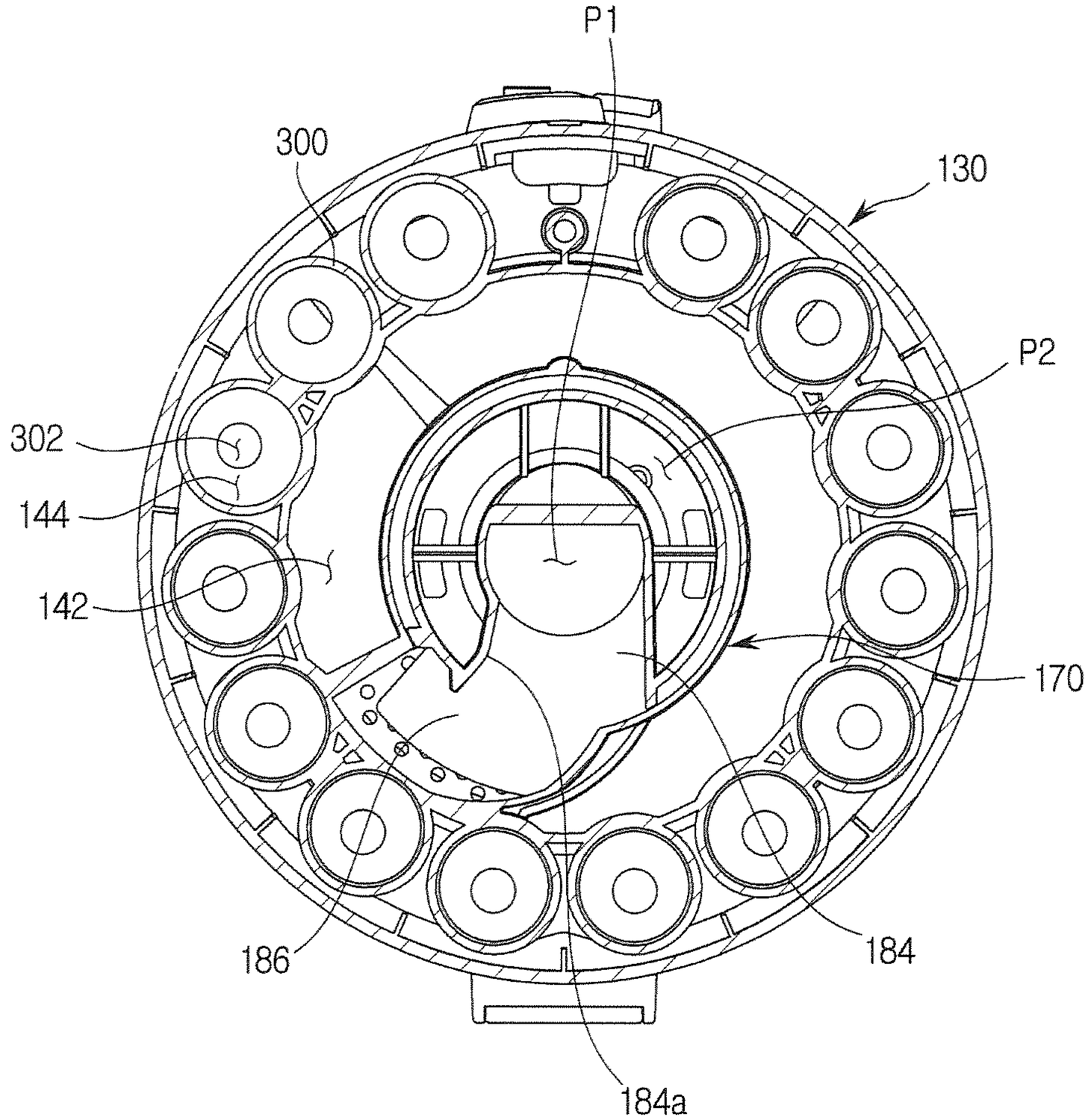
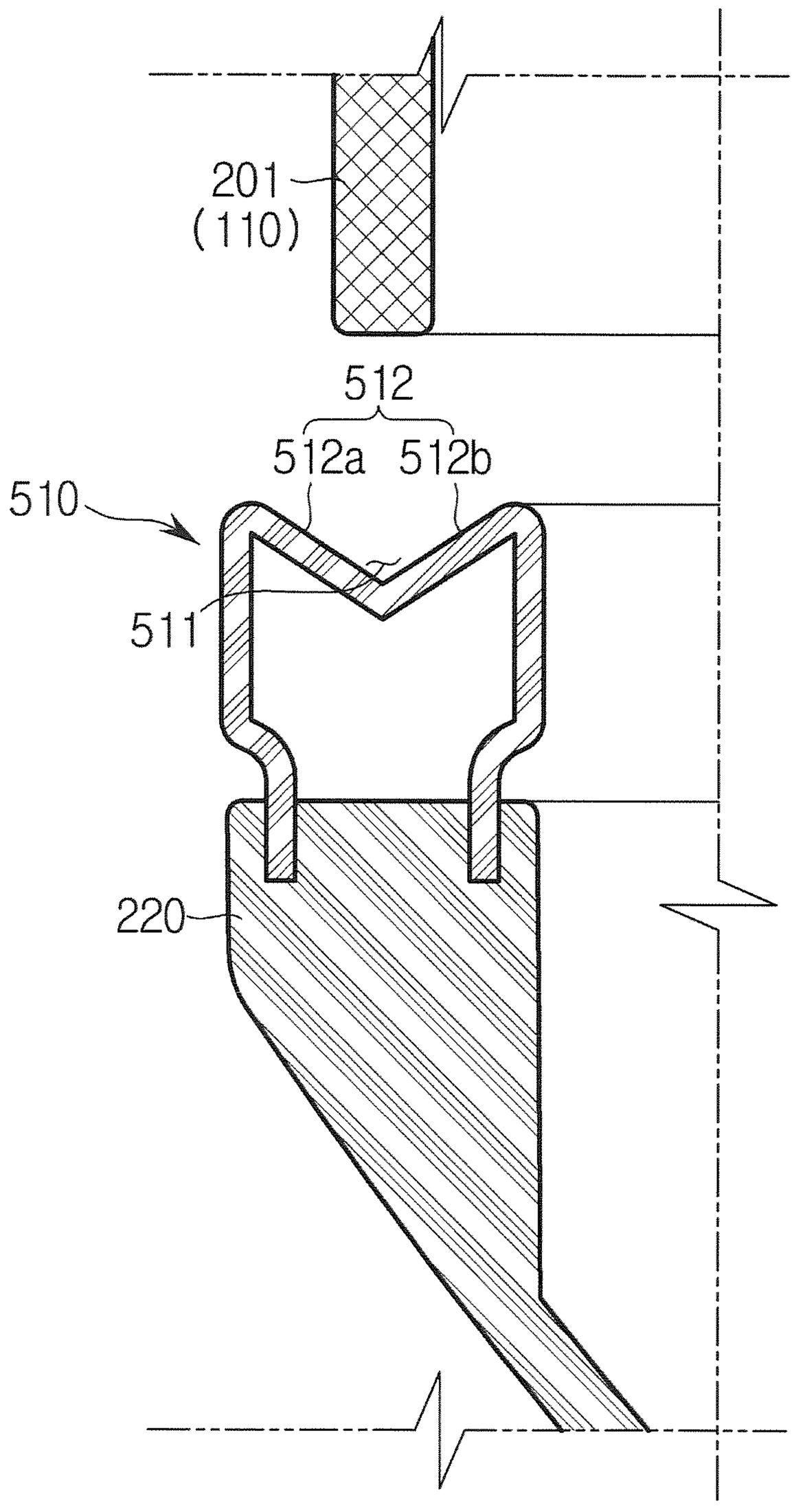
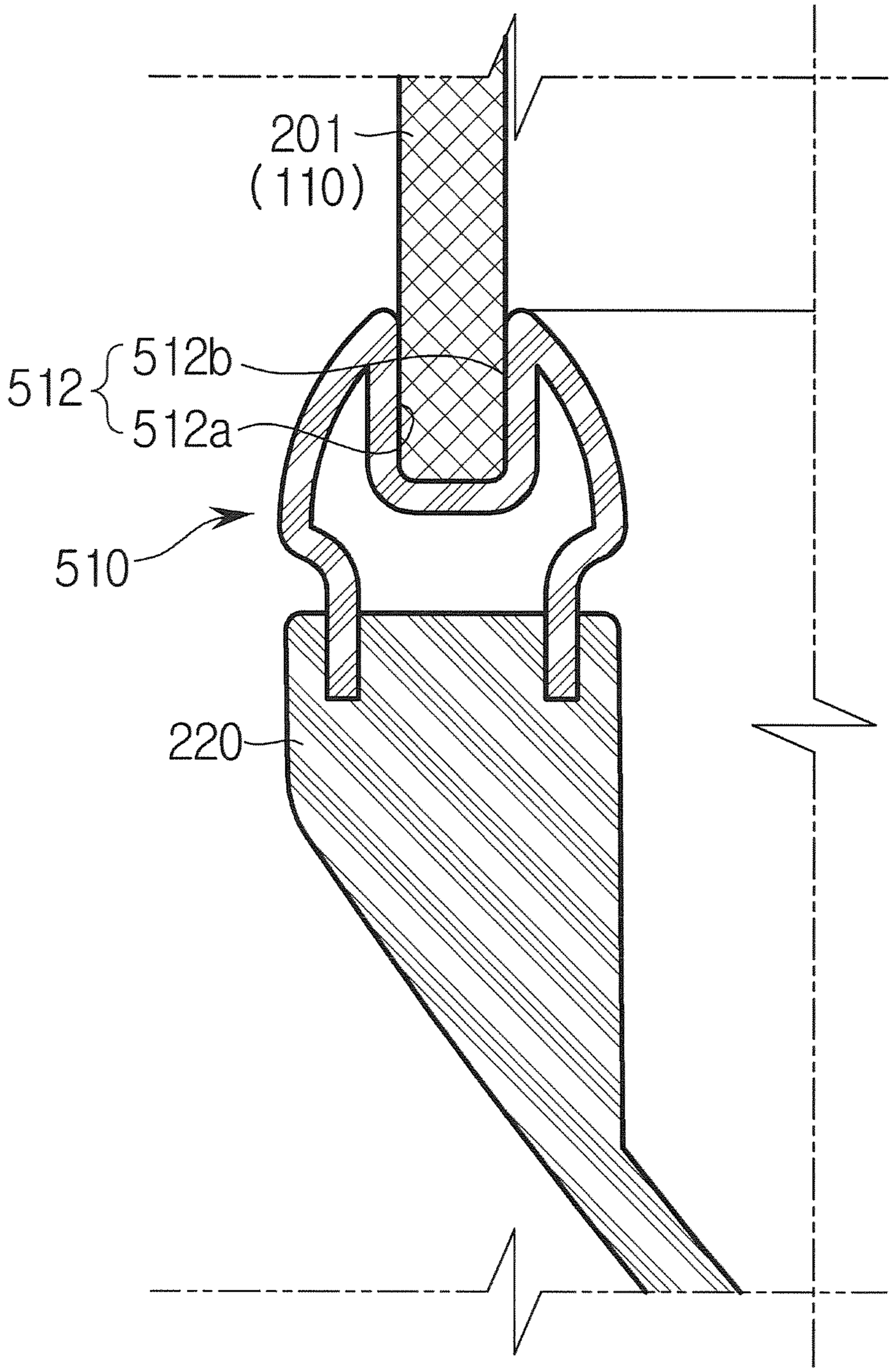
[Fig. 24]



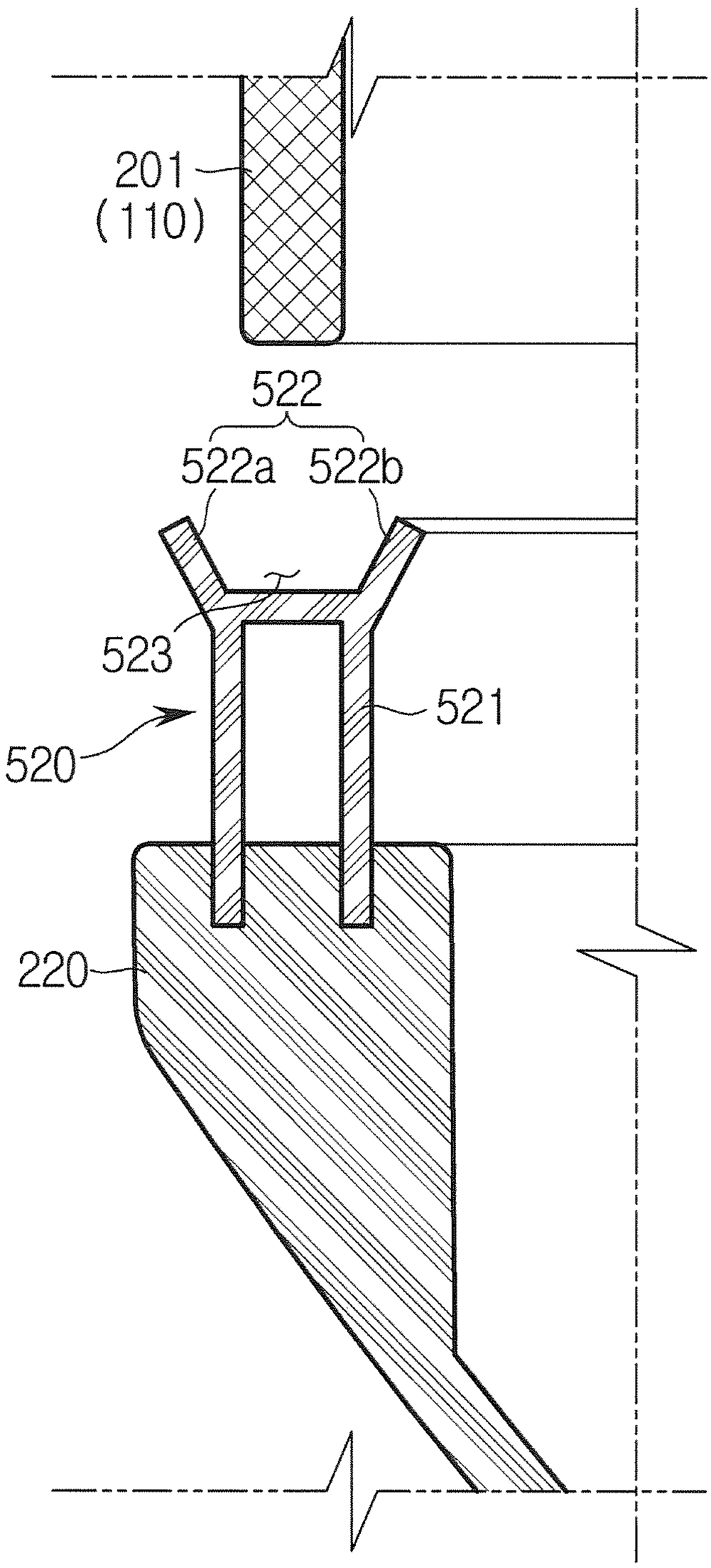
[Fig. 25]



[Fig. 26]



[Fig. 27]



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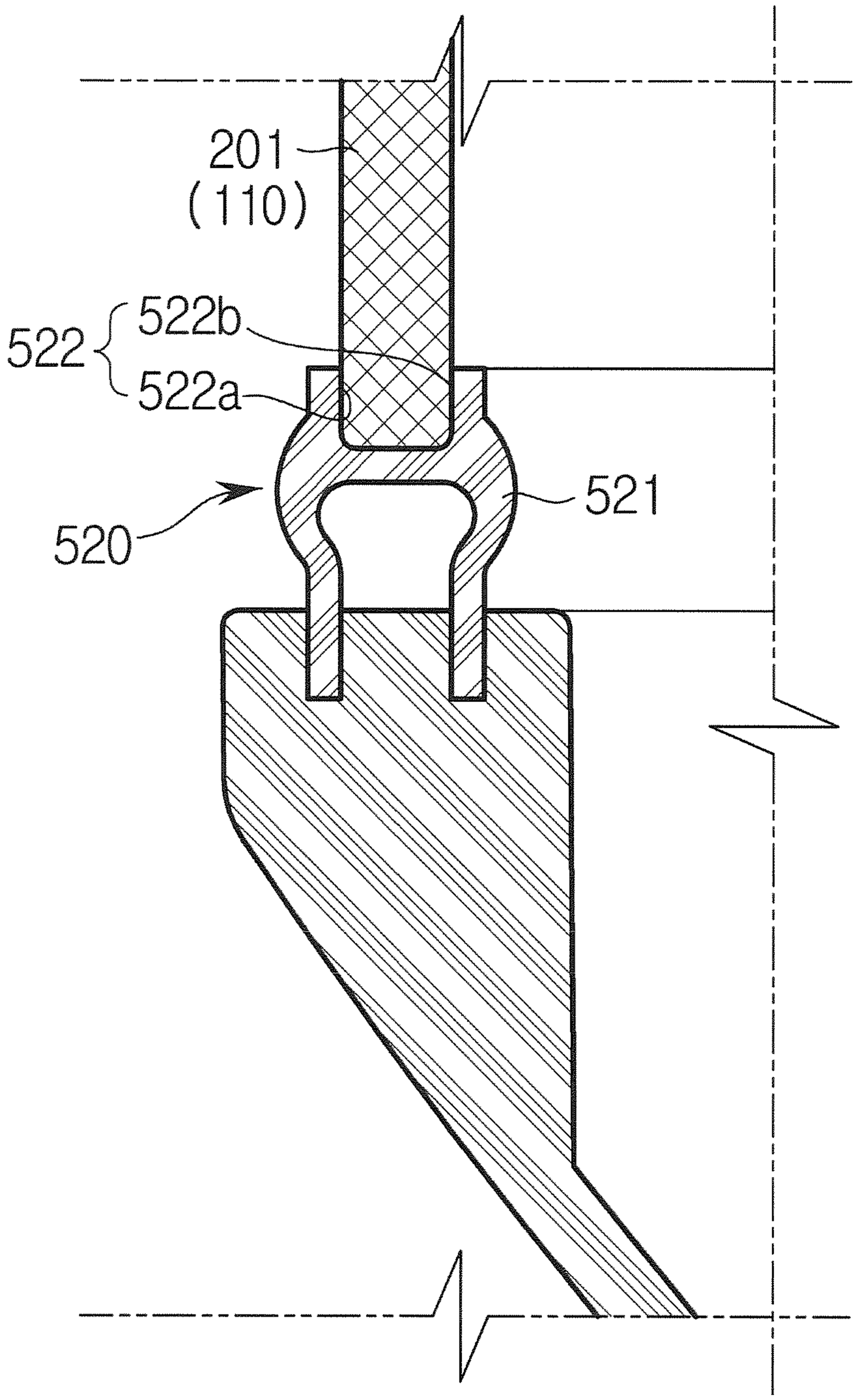
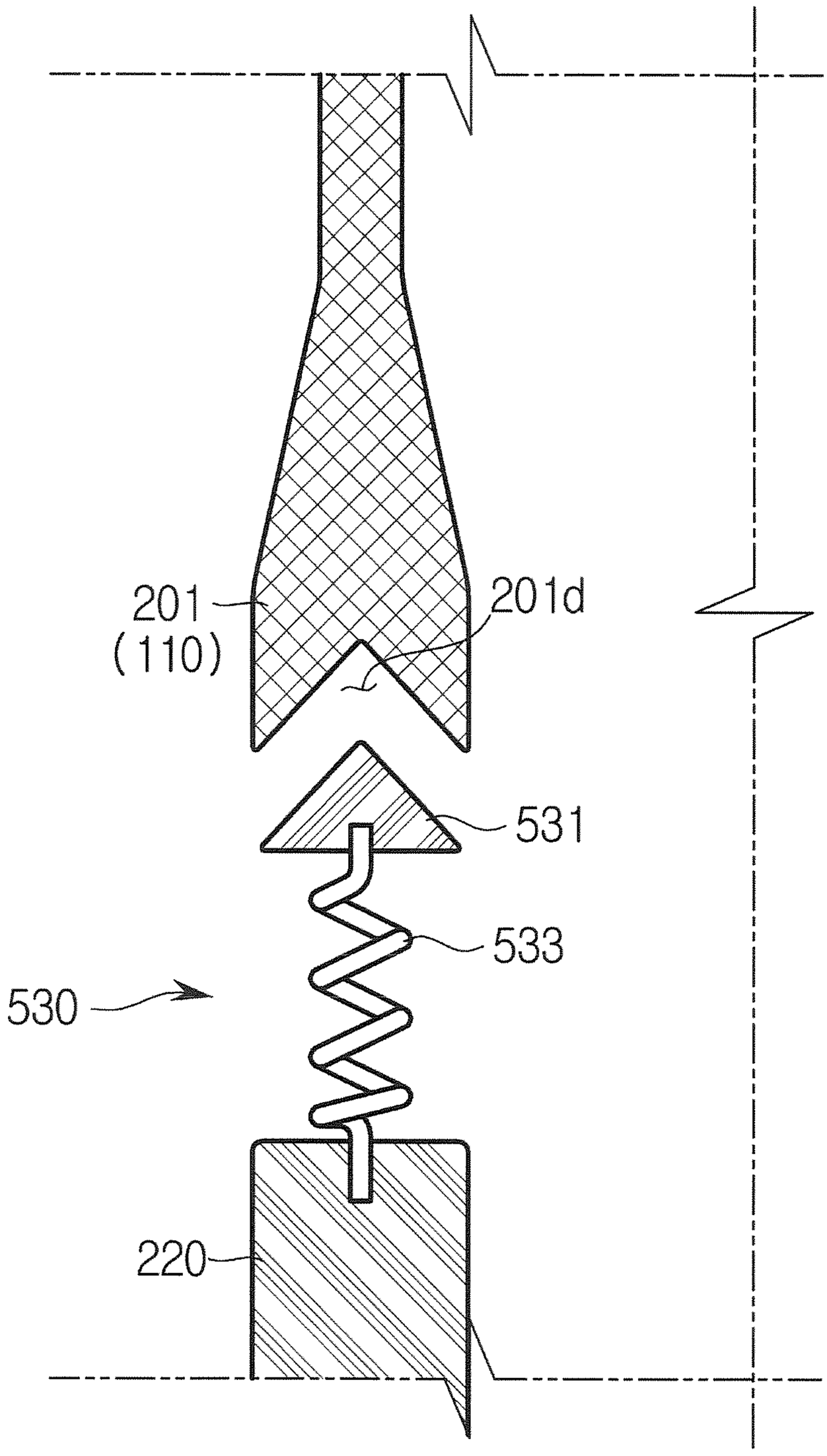
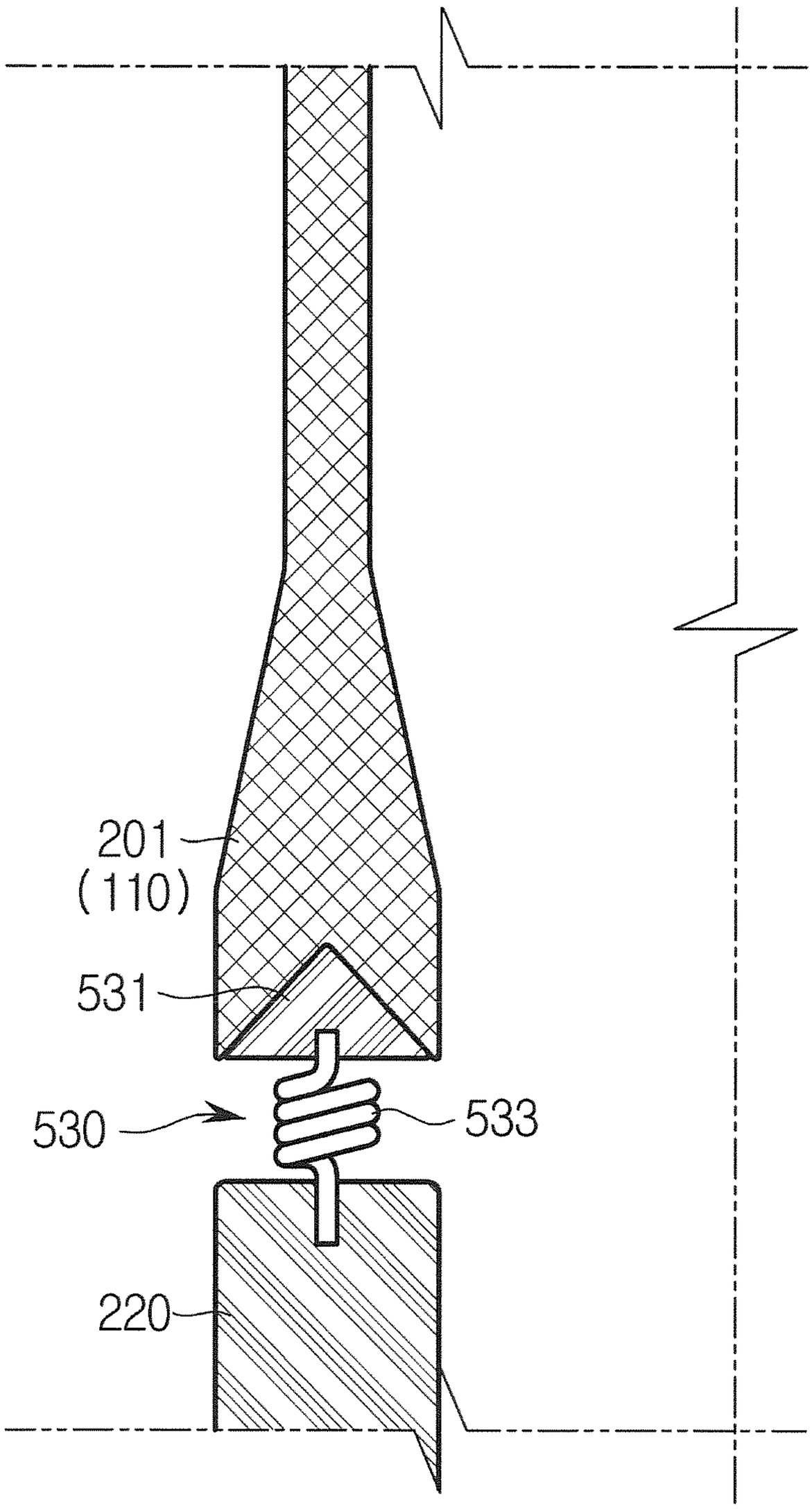


[Fig. 29]



[Fig. 30]



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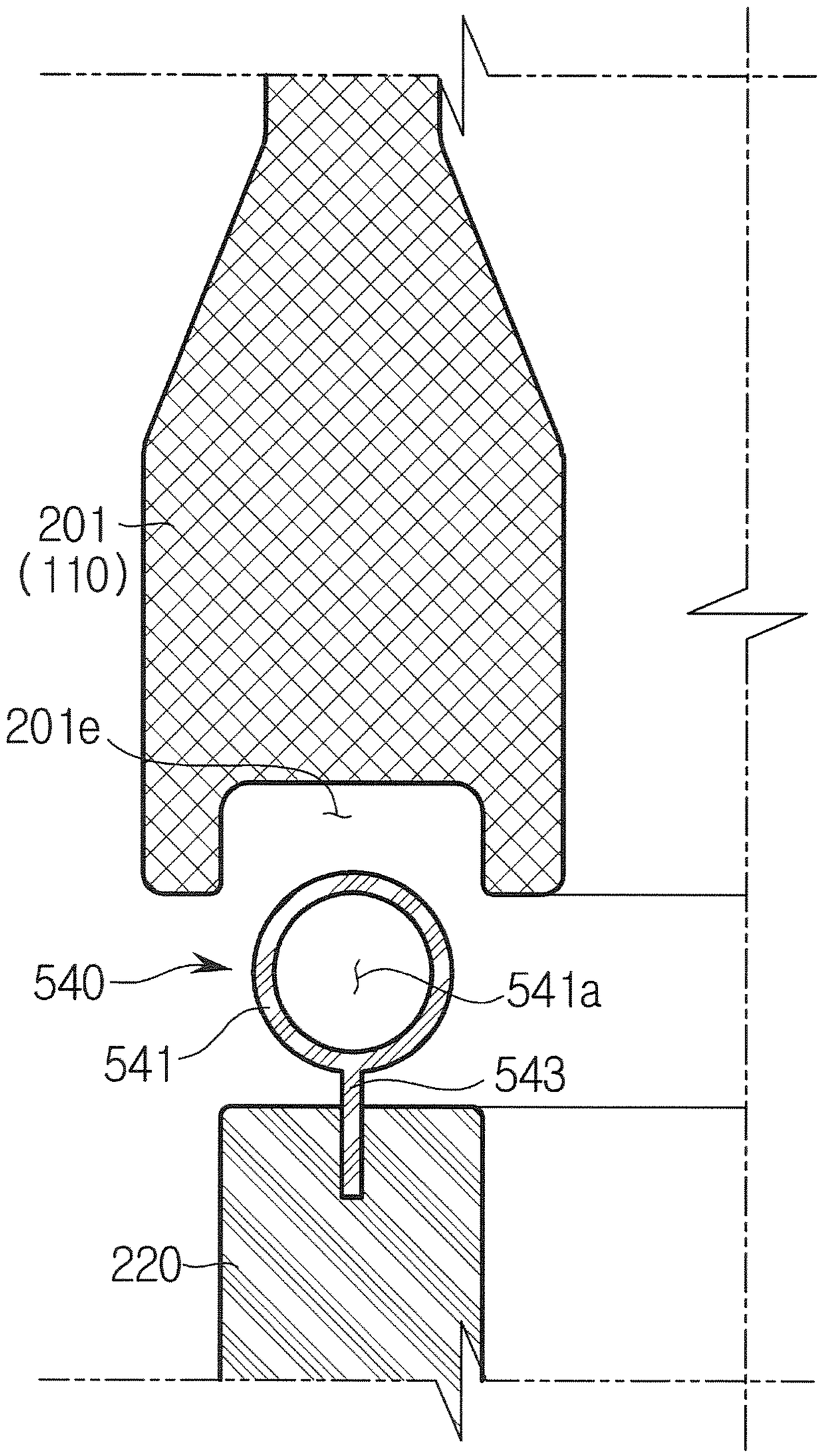

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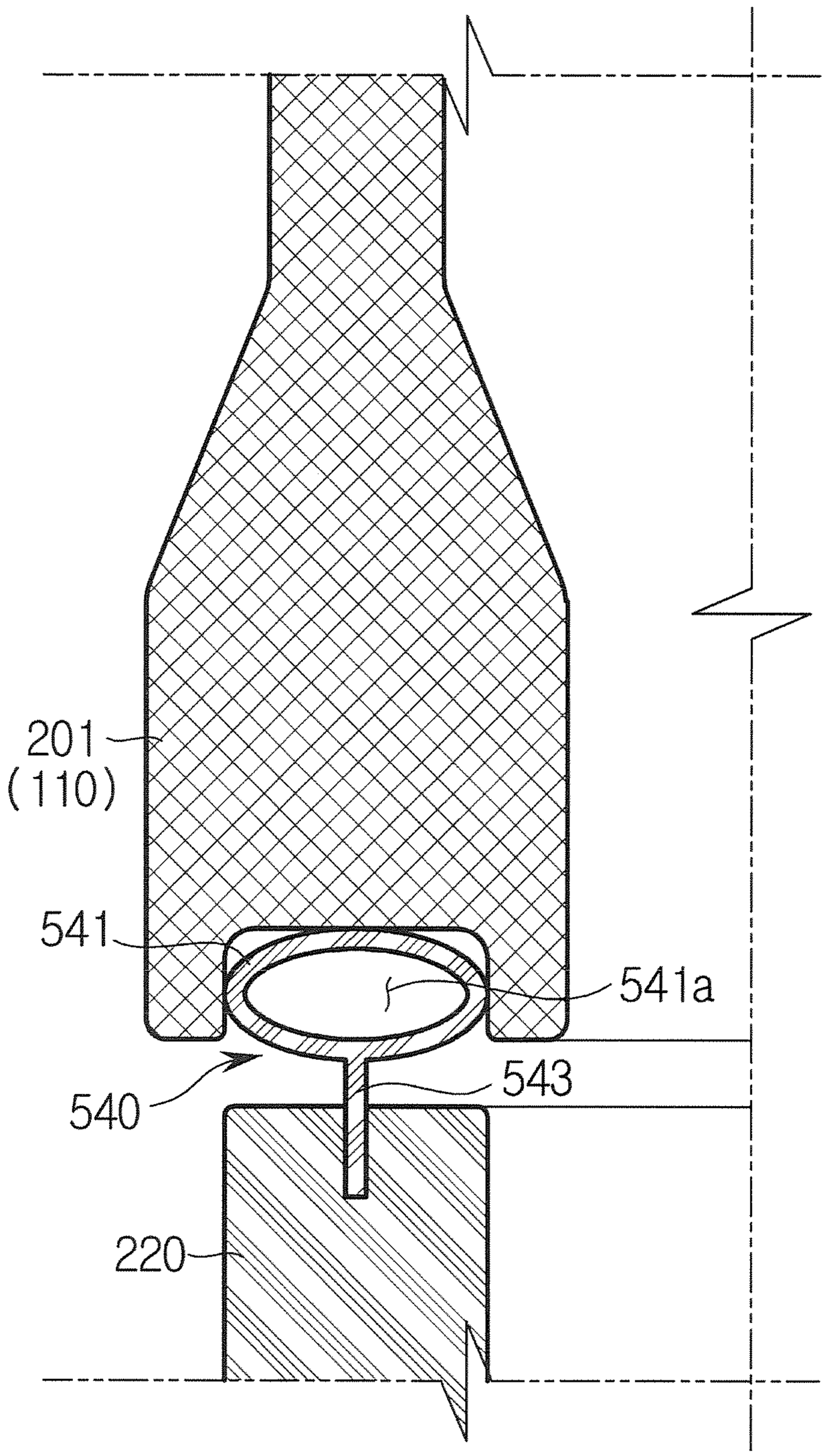
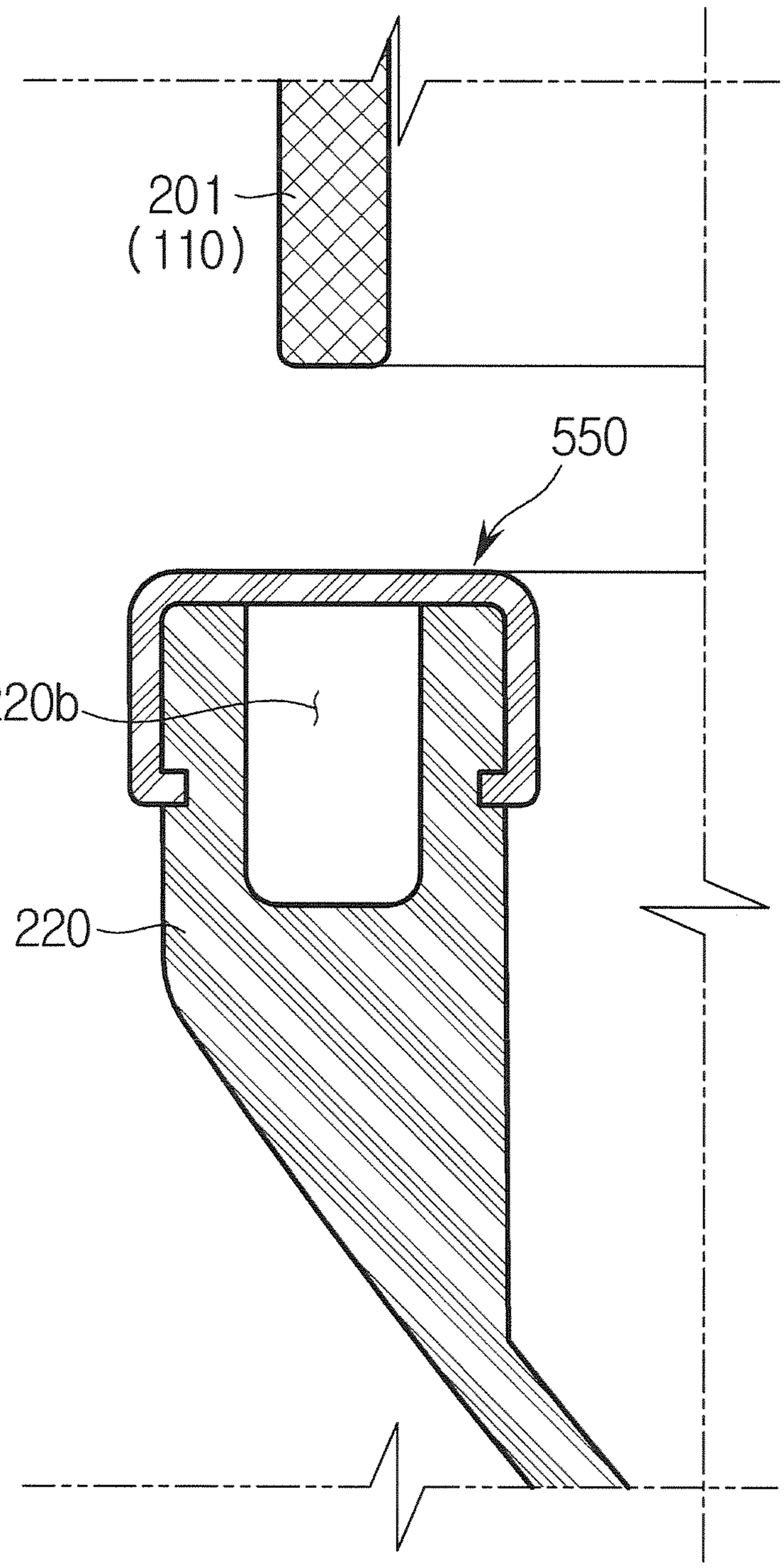
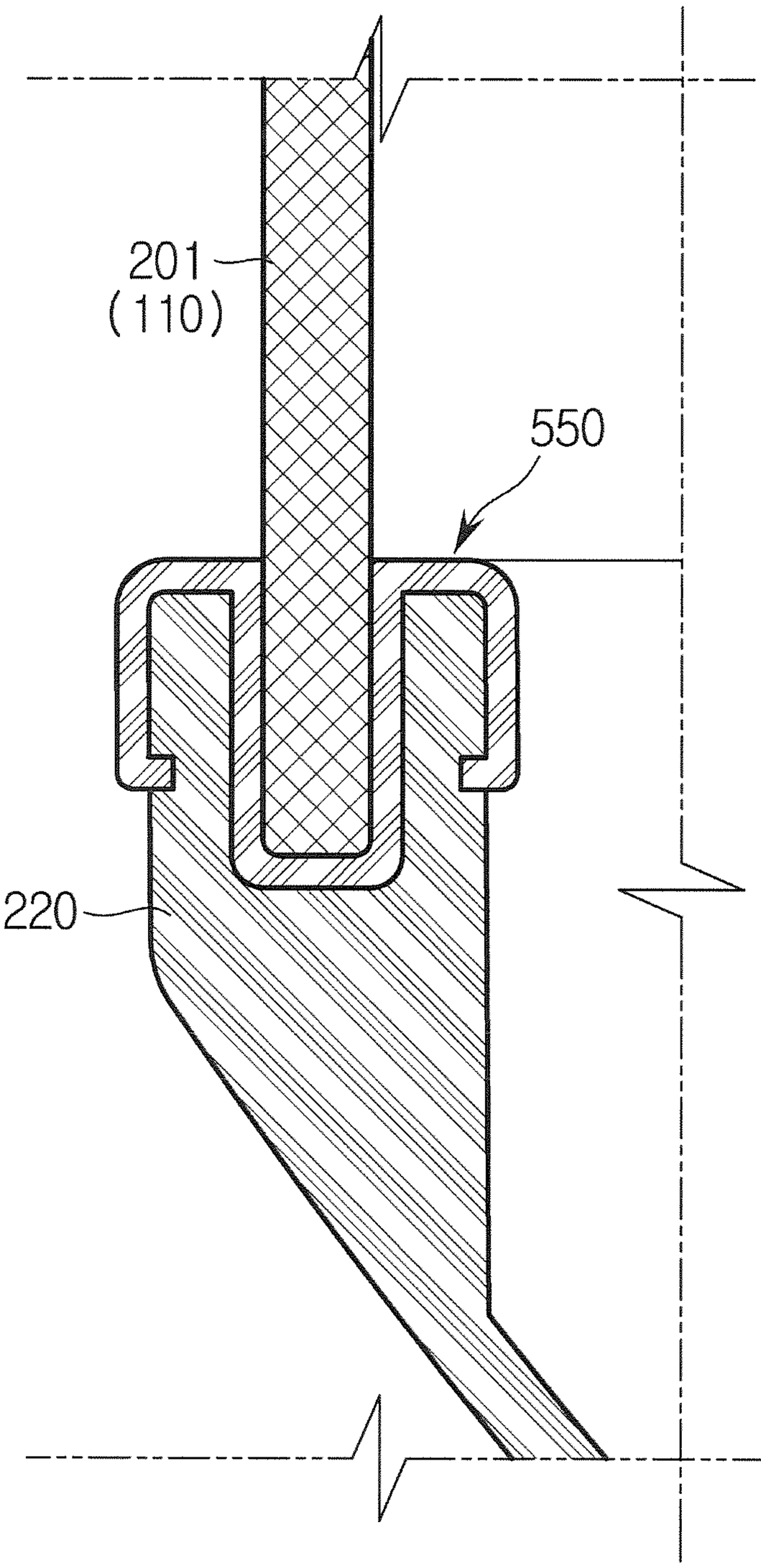


[Fig. 33]



[Fig. 34]



CLEANER AND DUST SEPARATING DEVICE APPLYING THE SAME

TECHNICAL FIELD

The present invention relates to a cleaner having an improved structure capable of preventing a leakage of dust and a breakdown in a dust collecting device which is opened and closed to separate the dust, and a dust collecting device applied to the same.

BACKGROUND ART

Generally, a cleaner is an apparatus in which air containing dirt on a surface to be cleaned is sucked, and the dirt is separated and collected from the air, and the cleaned air is discharged to an outside of a main body.

The cleaner is classified into a canister type in which a main body and a suction nozzle are separated and then connected with each other through a predetermined tube, and an up-right type in which the main body and the suction nozzle are formed as one body according to a type thereof.

The cleaner includes a driving unit which generates a suction force, a suction unit which sucks air on a surface to be cleaned using a suction force of the driving unit, and a dust collecting device which separates and collects dust from the air sucked by the suction unit and discharges the cleaned air.

Among dust collecting devices, a cyclone dust collecting device is a device which separates the dust in the sucked air using a centrifugal force. The cyclone dust collecting device may be semi-permanently used, and is sanitary and convenient, compared with a dust bag type dust collecting device, and thus used widely.

The cyclone dust collecting device may be used in various types such as the canister type, the up-right type, and a handy type, regardless of a shape or a kind of the cleaner.

The cyclone dust collecting device may include at least one cyclone. The at least one cyclone separates the dust from the air introduced into the cyclone dust collecting device using the centrifugal force. The cyclone generates a rotating air current therein, separates the dust from the air, moves the air from which the dust is separated to an outlet or another cyclone, and then secondarily separates the dust.

The cyclone dust collecting device is formed so that one side thereof is opened and closed to discharge the separated dust to an outside. At this time, an area to be opened and closed is sealed to maintain the suction force in the dust collecting device and also to prevent the dust from leaking to an outside. When a sealing member applied to the cyclone dust collecting device has an excellent sealing effect, the suction force in the dust collecting device is maintained and a leakage of the dust is reduced, but it is difficult to open and close the dust collecting device. On the other hand, when the sealing member is provided to easily open and close the dust collecting device, the dust may leak due to an external shock or the like.

DISCLOSURE OF INVENTION

Technical Problem

The present invention is directed to providing a cleaner having an improved structure capable of being sealed to prevent internal dust from leaking from a dust collecting device which is opened and closed, and a dust collecting device applied to the same.

Also, the present invention is directed to providing a cleaner having an improved structure capable of maintaining a sealing state in a dust collecting device even though an external shock is exerted, and a dust collecting device applied to the same.

Also, the present invention is directed to providing a cleaner having an improved structure capable of maintaining an excellent sealing state in a dust collecting device even though an external shock is exerted, and also being easily opened and closed, and a dust collecting device applied to the same.

Solution to Problem

One aspect of the present invention provides a cleaner including a dust collecting device for separating dust from air, wherein the dust collecting device includes a dust collecting case having a dust discharging port opened to discharge the collected dust; a discharge cover coupled to one side of the dust collecting case to open and close the dust discharge port; and a sealing member provided to extend from an inner surface of the dust collecting case to a coupling surface of the dust collecting case while being in contact with the dust collecting case and thus to be sealed when the dust discharging port is closed.

The sealing member may include a sealing portion provided to be in surface contact with the inner surface and the coupling surface; and a connection portion connected to the sealing portion and to vary a position of the sealing portion.

The sealing portion may include a first sealing portion configured to extend from the connection portion and provided to be in contact with an inner surface of the dust discharging port and thus to be sealed; and a second sealing portion configured to extend from one side of the first sealing portion and provided to be in contact with the coupling surface and thus to be sealed.

The first sealing portion is formed to have a first angle with respect to the second sealing portion, and the first angle may be smaller than 90°.

The sealing portion may further include a third sealing portion configured to extend from one side of the connection portion and provided to be in contact with the discharge cover at a lower portion of the first sealing portion and thus to be sealed.

The sealing member may further include a coupling portion configured to extend from one side of the connection portion and provided to be coupled to an inside of the discharge cover.

The coupling portion may be provided so that the sealing member is coupled to and separated from the discharge cover.

The sealing member may be formed of a material having a restoring force.

The sealing member may be configured so that the second sealing portion is located between the dust collecting case and the discharge cover while the dust collecting case and the discharge cover are coupled to each other, and at least a part of the second sealing portion is located at an outside of the discharge cover while the dust collecting case and the discharge cover are separated from each other.

Another aspect of the present invention provides a dust collecting device applied to a cleaner, the device includes a dust collecting case having a dust discharging port opened to discharge dust collected therein; a discharge cover coupled to one side of the dust collecting case to open and close the dust discharge port; and a sealing member installed along a surface in which the dust collecting case faces the discharge

cover, wherein the sealing member extends from an inner surface of the dust collecting case to a coupling surface of the dust collecting case while being in contact with the dust collecting case, and seals the dust collecting case and the discharge cover.

The sealing member may include a sealing portion provided to be in surface contact with the inner surface of the dust discharging port and the coupling surface of the dust collecting case; and a connection portion which is connected so that the sealing portion is able to be moved to a first position and a second position.

In the sealing member, the sealing portion may be located at the first position while the dust collecting case and the discharge cover are separated from each other, and the sealing portion may be located at the second position to seal the dust collecting case and the discharge cover while dust collecting case and the discharge cover are coupled to each other.

The sealing portion may include a first sealing portion configured to extend from the connection portion and provided to be in contact with an inner surface of the dust discharging port and thus to be sealed; and a second sealing portion configured to extend from one side of the first sealing portion and provided to be in contact with the coupling surface and thus to be sealed.

The first sealing portion may be formed to have a first angle with respect to the second sealing portion, and the first angle may be smaller than 90°.

The sealing member may further include a coupling portion configured to extend from one side of the connection portion and provided to be coupled to an inside of the discharge cover.

The sealing portion may further include a third sealing portion configured to extend from one side of the connection portion and provided to be in contact with the discharge cover at a lower portion of the first sealing portion and thus to be sealed.

The sealing member may have a restoring force.

The sealing member may be configured to be in surface contact with the inner surface and the coupling surface while a shape thereof is deformed due to coupling between the dust collecting case and the discharge cover.

Still another aspect of the present invention provides a cleaner including a dust collecting device for separating dust from air, wherein the dust collecting device includes a dust collecting case having a dust discharging port opened to discharge the collected dust; a discharge cover coupled to one side of the dust collecting case to open and close the dust discharge port; and a sealing member configured to be in surface contact from a coupling surface of the dust collecting case to an inner surface of the dust collecting case and to seal the dust collecting case and the discharge cover, and the sealing member has a restoring force, and when the dust discharge port is switched from an opened state to a closed state, a shape of the sealing member is deformed to seal the dust collecting case and the discharge cover.

Advantageous Effects of Invention

According to one embodiment of the present invention, the dust collecting device has the improved structure, and thus the sealing state can be maintained even when the external shock is exerted.

According to one embodiment of the present invention, the dust collecting device can be easily opened and closed, and can have an improved sealing effect.

According to one embodiment of the present invention, the enhanced sealing effect can be provided by increasing a contact area between the sealing member and the dust collecting device.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a view illustrating a cleaner according to one embodiment.

FIG. **2** is a view illustrating a state in which a dust collecting device is separated from a main body of the cleaner according to one embodiment.

FIG. **3** is an exploded perspective view illustrating the dust collecting device of the cleaner according to one embodiment.

FIG. **4** is a cross-sectional view illustrating a cross section of the dust collecting device of the cleaner according to one embodiment.

FIG. **5** is a view illustrating a state in which a discharge cover is opened in the dust collecting device of the cleaner according to one embodiment.

FIG. **6** is an exploded perspective view illustrating the discharge cover and a sealing member in the dust collecting device of the cleaner according to one embodiment.

FIG. **7** is a view enlargedly illustrating a cross section of the sealing member of FIG. **6**.

FIG. **8** is a view illustrating a state in which the sealing member of FIG. **6** is located at a first position.

FIG. **9** is a view illustrating a state in which the sealing member of FIG. **6** is located at a second position.

FIG. **10** is a view illustrating a process in which the sealing member seals the discharge cover and a dust collecting case in the dust collecting device according to one embodiment of the present invention.

FIGS. **11** and **12** are views illustrating a first modified example of the sealing member of FIG. **7**.

FIGS. **13** and **14** are views illustrating a second modified example of the sealing member of FIG. **7**.

FIGS. **15** and **16** are views illustrating a third modified example of the sealing member of FIG. **7**.

FIGS. **17** and **18** are views illustrating a fourth modified example of the sealing member of FIG. **7**.

FIGS. **19** and **20** are views illustrating a fifth modified example of the sealing member of FIG. **7**.

FIGS. **21** and **22** are views illustrating a sixth modified example of the sealing member of FIG. **7**.

FIGS. **23** and **24** are views illustrating a seventh modified example of the sealing member of FIG. **7**.

FIG. **25** is an exploded perspective view illustrating the dust collecting device including a dust catching member according to another embodiment of the present invention.

FIG. **26** is a cross-sectional view illustrating a cross section of the dust collecting device of FIG. **25**.

FIG. **27** is a cross-sectional view illustrating a discharge cover including the dust catching member of FIG. **25**.

FIG. **28** is a view illustrating the discharge cover including a first modified example of the dust catching member of FIG. **25**.

FIG. **29** is a perspective view illustrating a dust collecting device including a second modified example of the dust catching member of FIG. **25**.

FIG. **30** is a view illustrating a cross section of the dust collecting device of FIG. **29**.

FIG. **31** is a perspective view illustrating a grill unit of FIG. **3**.

FIG. **32** is a perspective view illustrating a cyclone body of FIG. **3**.

FIG. **33** is a cut-away perspective view illustrating a coupling structure of the grill unit and the cyclone body of FIG. **3**.

FIG. **34** is a view of the dust collecting device taken along a line A-A' of FIG. **4**.

MODE FOR THE INVENTION

Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings. Meanwhile, the terms such as "front end", "rear end", "upper", "lower", "upper end" and "lower end" used in the specification are defined based on the drawings, and a shape and a location of each element should not be limited by the terms.

FIG. **1** is a view illustrating a cleaner according to one embodiment, and FIG. **2** is a view illustrating a state in which a cyclone dust collecting device is separated from a main body of the cleaner according to one embodiment. Hereinafter, a dust collecting device **100** may be used as a meaning including the cyclone dust collecting device. Hereinafter, dirt may be used as a meaning embracing various foreign substances including dust.

As illustrated in FIGS. **1** and **2**, the cleaner **1** may include a main body **10**, the dust collecting device **100**, a suction part **21**, and a wheel assembly **50**. The dust collecting device **100** and the wheel assembly **50** may be installed at the main body **10**. In particular, the dust collecting device **100** may be removably installed at the main body **10**. The suction part **21** may be in contact with a surface to be cleaned, and may suck foreign substances on the surface to be cleaned.

The main body **10** may include a fan motor (not shown) which generates a suction force. The suction part **21** may suck air on the surface to be cleaned and dust contained in the air by the suction force generated in the main body **10**. The suction part **21** may be provided in a wide shape to be in close contact with the surface to be cleaned.

An extension tube **20**, a handle tube **30**, and a flexible hose **23** may be provided between the main body **10** and the suction part **21**. The extension tube **20** may be formed of a resin material or a metallic material, and may connect the suction part **21** with the handle tube **30**.

The handle tube **30** is provided to connect the extension tube **20** with the flexible hose **23**. A handle part **31** and an operation part **32** may be provided at the handle tube **30**. A user may grasp the handle part **31** and then may perform a cleaning operation. Also, the user may operate a button or the like provided at the operation part **32**, and may operate a function of the cleaner, for example to turn on/off the cleaner **1** or adjust a suction intensity.

The flexible hose **23** connects the handle tube **30** with the main body **10**. The flexible hose may be provided to have a flexible material, such that the handle tube **30** is freely moved.

All of the suction part **21**, the extension tube **20**, the handle tube **30** and the flexible hose **23** may be provided to be in communication with each other. The air sucked by the suction part **21** may pass in turn through the extension tube **20**, the handle tube **30**, and the flexible hose **23**, and then may be introduced into the main body **10**.

The main body **10** may have a first body port **10***a* which guides the sucked air to the dust collecting device **100**, and a second body port **10***b* through which the air cleaned in the dust collecting device **100** is discharged. The second body port **10***b* may be in communication with a suction chamber (not shown) at which the fan motor (not shown) is provided.

The main body **10** may have an installation part **11** at which the dust collecting device **100** is installed. The dust collecting device **100** may be removably installed at the installation part **11**. The dust collecting device **100** may allow the air cleaned by separating and collecting the dust from the air sucked through the suction part **21** to flow to the fan motor (not shown) through the second body port **10***b*.

The dust collecting device **100** separates the dust from the air using centrifugation. That is, the dust collecting device **100** generates a rotating air current and separates the dust from the air using a centrifugal force. When a predetermined amount of the dust is collected in the dust collecting device **100**, the user may separate the dust collecting device **100** from the main body **10**, and then may throw away the dust collected in the dust collecting device **100**.

FIG. **3** is an exploded perspective view illustrating the dust collecting device of the cleaner according to one embodiment, FIG. **4** is a cross-sectional view illustrating a cross section of the dust collecting device of the cleaner according to one embodiment, FIG. **5** is a view illustrating a state in which a discharge cover is opened in the dust collecting device of the cleaner according to one embodiment, and FIG. **6** is an exploded perspective view illustrating the discharge cover and a sealing member in the dust collecting device of the cleaner according to one embodiment.

As illustrated in FIGS. **3** to **6**, the dust collecting device **100** according to one embodiment of the present invention may include a dust collecting case **110**, a discharge cover **220**, and a sealing member **230**.

The dust collecting case **110** is coupled to the main body **10**, and serves to collect dirt such as the dust in the air. The dust collecting case **110** may be provided to be coupled to the main body **10**, to filter the dirt from the sucked air, and to discharge the air from which the dirt is filtered.

The dust collecting case **110** may include a suction port **220***a* and a discharge port **122**. The air sucked through the suction part **21** is introduced into the dust collecting case **110** through the suction port **220***a*, and is separated from the dust in the dust collecting case **110**. The air from which the dust is separated is discharged to the main body **10** through the discharge port **122**. Specifically, the air discharged from the dust collecting case **110** through the discharge port **122** flows to the suction chamber (not shown) through the second body port **10***b*.

The dust collecting case **110** may include an inlet **111** through which the air is introduced, and an outlet **112** through which the air is discharged. In other words, the dust collecting case **110** may include the inlet **111** through which the air containing the dirt, i.e., the contaminated air is introduced, and the outlet **112** through which the air from which the dirt is removed, i.e., the cleaned air is discharged. The inlet **111** may be provided at the suction port **220***a*, and the outlet **112** may be provided at the discharge port **122**.

The dust collecting case **110** may form an exterior of the dust collecting device **100**. A part of the dust collecting case **110** may be formed of a transparent material to allow an internal space to be seen. The dust collecting case **110** may have a cylindrical shape, but the present invention is not limited thereto.

The dust collecting case **110** may include an upper case **120**, a middle case **130**, and a dust collecting container **200**.

The middle case **130** may be formed in an approximately cylindrical shape of which upper and lower surfaces are opened. A filter member **134** may be provided at an upper portion of the middle case **130** to remove the dirt remaining in the air passing through cyclone chambers **142** and **144**.

The filter member **134** may be provided at an upper opening **132** formed at the upper portion of the middle case **130**. That is, the filter member **134** may be provided at the upper opening **132** of the middle case **130** to remove the dirt remaining in the air passing through the first and second cyclone chambers **142** and **144**.

The upper case **120** may be provided on the middle case **130**. The upper case **120** may be hinge-coupled to a hinge portion **136** provided at the middle case **130**, and thus may be pivotably provided. The discharge port **122** through which the air cleaned while passing through the cyclone chambers **142** and **144** and the filter member **134** is discharged may be provided at the upper case **120**. The discharge port **122** may be in communication with the suction chamber (not shown) located in the main body **10** at which the fan motor (not shown) is provided.

The dust collecting container **200** may be disposed to accommodate the dust separated from the air and to be in communication with at least one cyclone **300**. Also, the dust collecting container **200** may be provided under the middle case **130** to collect the dirt contained in the air.

The dust collecting container **200** may include a container body **201**, and a dust collecting chamber **205** which is provided in the container body **201** to accommodate the dirt.

The dust collecting chamber **205** may include a first dust collecting chamber **205***a* and a second dust collecting chamber **205***b*. The first dust collecting chamber **205***a* may be provided to correspond to the first cyclone chamber **142**, and the second dust collecting chamber **205***b* may be provided to correspond to the second cyclone chamber **144**. That is, the dust discharged from the first cyclone chamber **142** may be collected in the first dust collecting chamber **205***a*, and the dust discharged from the second cyclone chamber **144** may be collected in the second dust collecting chamber **205***b*. Since the second cyclone chamber **144** is disposed along a circumference of the first cyclone chamber **142** in a circumferential direction, the second dust collecting chamber **205***b* may be provided to correspond to the second cyclone chamber **144** in the circumferential direction with respect to the first dust collecting chamber **205***a*. That is, the second dust collecting chamber **205***b* may be provided in an annular shape, and at least a part of the second dust collecting chamber **205***b* may be formed at an upper portion of the first dust collecting chamber **205***a* along a circumference thereof.

The second dust collecting chamber **205***b* may include a discharge chamber **205***c*. The discharge chamber **205***c* may be provided to collect the dirt accumulated in the second dust collecting chamber **205***b*. The discharge chamber **205***c* may be provided at a deep section of the second dust collecting chamber **205***b*.

The dust collecting chamber **205** may have a dust discharging port **205***d* which is opened at one side thereof to discharge the collected dirt or the like to an outside. The dust discharging port **205***d* may be provided to be opened and closed by the discharge cover **220**.

The container body **201** may include a container outer wall **202** and a container inner wall **203**. The container outer wall **202** may be provided to have a cylindrical shape of which upper and lower portions are opened, and the container inner wall **203** may have a flange shape which extends inward to have an annular space at an inner upper portion of the container outer wall **202**. The first dust collecting chamber **205***a* may be provided to be surrounded by an inside of the container outer wall **202**, an inside of the container inner wall **203**, and the discharge cover **220**. The second dust collecting chamber **205***b* may be provided to be surrounded by the inside of the container outer wall **202**, an outside of the container inner wall **203**, and the discharge cover **220**.

At least a part of the dust collecting container **200** may be formed of a transparent material to allow the dust collecting chamber **205** to be seen from an outside.

The discharge cover **220** may be coupled to one side of the dust collecting case **110** to open and close the dust discharging port **205***d*. The discharge cover **220** may be hinge-coupled to one side of the dust collecting case **110**. The discharge cover **220** may be pivoted about a hinge **227**, and may open and close the dust discharging port **205***d*.

The discharge cover **220** may further include a fixing member **229** which fixes the discharge cover **220** in a state coupled with the dust collecting case **110**. The fixing member **229** may include a first fixing member **229***a* which is provided at one side of the discharge cover **220**, and a second fixing member **229***b* which is installed at a position of the dust collecting container **200** corresponding to the first fixing member **229***a*. The first fixing member **229***a* and the second fixing member **229***b* may be provided to be coupled to each other, such that the discharge cover is fixed and coupled to the dust collecting container **200**.

The suction port **220***a* may be provided at the discharge cover **220**. The suction port **220***a* may be provided so that the air introduced from the flexible hose **23** is introduced into the dust collecting device **100**. The suction port **220***a* may be provided to be in communication with an inlet tube **173**. The suction port **220***a* may be provided at the discharge cover **220** so that the air sucked from the suction part **21** is not introduced by detouring through a side surface of the dust collecting case **110**, but introduced through a lower portion of the dust collecting case **110**. The inlet **111** may be provided at the suction port **220***a*. The inlet **111** may be disposed at a center of the suction port **220***a*, but the present invention is not limited thereto.

Hereinafter, the sealing member **230** according to one embodiment of the present invention will be described. The sealing member **230** seals the discharge cover **220** and the dust collecting case **110**, and thus may prevent the dust in the dust collecting device **100** from leaking to the outside, and also may constantly maintain an internal pressure of the dust collecting device **100**.

FIG. **7** is a view enlargedly illustrating a cross section of the sealing member of FIG. **6**, FIG. **8** is a view illustrating a state in which the sealing member of FIG. **6** is located at a first position, and FIG. **9** is a view illustrating a state in which the sealing member of FIG. **6** is located at a second position.

Referring to FIGS. **7** to **9**, the sealing member **230** may include a sealing portion **231** and a connection portion **235**. When the dust discharging port **205***d* is closed, the sealing member **230** may be provided to extend to a coupling surface **201***b* while being in contact with an inner surface **201***a* of the dust collecting case **110**, and thus to provide a sealing effect. The sealing member **230** may be installed along a surface in which the dust collecting case **110** faces the discharge cover **220**.

The sealing portion **231** may be provided to be in contact with each of the discharge cover **220** and the container body **201** of the dust collecting case **110**, and thus to provide the sealing effect. Hereinafter, the dust collecting case **110** which is in contact with the sealing portion **231** may be used as a meaning including the container body **201** in contact with the sealing portion **231**.

The sealing portion **231** may include a first sealing portion **232** and a second sealing portion **233**.

The first sealing portion **232** may be provided to extend from a connection portion **235**. The first sealing portion **232** may be provided to be in contact with the inner surface **201***a* of the dust collecting case facing the dust discharging port **205***d*, and thus to provide the sealing effect. The first sealing portion **232** may be provided so that a position thereof is varied when the dust discharging port **205***d* is opened and closed by the discharge cover **220**.

The second sealing portion **233** may be provided to extend from the first sealing portion **232**. The second sealing portion **233** may be formed to have a first angle α with respect to the second sealing portion **233**. According to an example, the first angle α may be smaller than 90°. Since the sealing portion **231** is formed of a material having elasticity, when the first angle α is 90° or more, a restoring force may be generated at the first and second sealing portions **232** and **233**. Therefore, the dust collecting case **110** may be effectively sealed between the first and second sealing portions **232** and **233**. On the other hand, the first angle α is greater than 90°, such that the dust collecting case **110** is easily in contact with the first and second sealing portions **232** and **233**.

The second sealing portion **233** may be provided to be in contact with the coupling surface **201***b* of the dust collecting case facing the discharge cover **220** and thus to provide the sealing effect. The second sealing portion **233** may be provided together with the first sealing portion **232** so that a position thereof is varied when the dust discharging port **205***d* is opened and closed by the discharge cover **220**.

The sealing portion **231** may further include a third sealing portion **234**. The third sealing portion **234** may be formed by extending from one side of the connection portion **235**. The third sealing portion **234** may be located to be spaced from the first and second sealing portions **232** and **233**. The third sealing portion **234** may be provided so that one side surface thereof is in contact with a coupling surface **227** of the discharge cover **220** facing the coupling surface **201***b* of the dust collecting case, and thus may provide the sealing effect.

The connection portion **235** may be provided to be connected to one side of the sealing portion **232**. The connection portion **235** may be provided so that a position thereof is varied. Therefore, the connection portion **235** may vary a position of the sealing portion **232**.

The connection portion **235** may include a material having the elasticity. Therefore, when an external force is applied, the position of the connection portion **235** may be moved, and when the external force is removed, the connection portion **235** may be returned to its original position. The entire sealing member **230** including the connection portion **235** may be formed of the material having the elasticity.

The connection portion **235** may be provided to have a shape which is rounded to an inside of the dust collecting device. Therefore, the connection portion **235** may easily move the positions of the first and second sealing portions **232** and **233**.

A coupling portion **236** may be provided to extend from one side of the connection portion **235**. The coupling portion **236** may be provided to be coupled to one side of the discharge cover **220**. The coupling portion **236** may be coupled into a fixing groove **225** provided at the discharge cover **220**. The fixing groove **225** may be provided at an inner edge area of the discharge cover **220**. The fixing groove **225** may be provided at a position which is spaced inward from the coupling surface **227** of the discharge cover **220**. The fixing groove **225** may be provided so that the coupling portion **236** is inserted into a space **225***c* between protruding portions **225***a* and **225***b* which protrude upward to have a predetermined distance at an inside of the discharge cover **220**. Therefore, the coupling portion **236** may fix the sealing member **230** to the discharge cover **220**.

The coupling portion **236** may be provided to be coupled to and separated from the discharge cover **220**. Therefore, the sealing member **230** may be provided to be coupled to and separated from the discharge cover **220**.

As illustrated in FIGS. **8** and **9**, the sealing member **230** may be provided to be movable to first and second positions. As illustrated in FIG. **8**, when the discharge cover **220** is separated from the dust collecting case **110**, the sealing member **230** may be provided at the first position. The first position may be defined as a position in a state in which the external force is not applied. The sealing member **230** may be provided so that at least a part thereof is located at an outside of the discharge cover **220** at the first position. The sealing member **230** may be provided so that a part of the first sealing portion **232** or the second sealing portion **233** is located at the outside of the discharge cover **220** at the first position. The first and second sealing portions **232** and **233** may be located to be spaced a predetermined distance from the third sealing portion **234**.

As illustrated in FIG. **9**, when the discharge cover **220** is coupled to the dust collecting case **110**, the sealing member **230** may be provided at the second position. The second position may be defined as a position at which the sealing member **230** is in contact with the dust collecting case **110** and provides the sealing effect. The sealing member **230** at the second position may be located to be further moved to the inside of the discharge cover **220** than at the first position.

The sealing member **230** at the second position may be located so that the first and second sealing portions **232** and **233** are in contact with the inner surface **201***a* of the dust collecting case and the coupling surface **201***b* of the dust collecting case, respectively. The sealing member **230** has the elasticity at the second position, and thus may have a restoring force intended to be returned to the first position. Therefore, the sealing member **230** may enhance the inner surface **201***a* of the dust collecting case and the coupling surface **201***b* of the dust collecting case due to the restoring force generated at the second position. The sealing member **230** may be provided so that the second sealing portion **233** is in contact with the third sealing portion **234** at the second position.

The third sealing portion **234** may be provided at a fixed position. The third sealing portion **234** may be located to be in contact with the coupling surface **227** of the discharge cover **220**, and may seal the discharge cover **220**. The third sealing portion **234** may be located to be spaced from the second sealing portion **233**, when the sealing member **230** is located at the first position, and may also be located to be in contact with the second sealing portion **233**, when the sealing member **230** is located at the second position.

As described above, a shape of the sealing member **230** may be configured to be in surface contact with the inner surface **201***a* and the coupling surface **201***b*, while a shape thereof is deformed by coupling of the dust collecting case **110** and the discharge cover **220**. When the dust discharging port **205***d* is switched from an opened state to a closed state, the sealing member **230** is deformed and thus may seal the dust collecting case **110** and the discharge cover **220**.

Hereinafter, a process in which the sealing member according to one embodiment of the present invention seals the discharge cover and the dust collecting case will be described.

FIG. **10** is a view illustrating the process in which the sealing member seals the discharge cover and the dust collecting case in the dust collecting device according to one embodiment of the present invention.

Referring to FIG. **10**, FIG. **10**A is a view illustrating a state in which the sealing member is provided at the first position, FIG. **10**B is a view illustrating a state in which the sealing member is moved and a position thereof is moved while being in contact with the dust collecting case, and FIG. **10**C is a view illustrating a state in which the discharge cover is coupled to the dust collecting case and the sealing member is provided at the second position.

As illustrated in FIG. **10**A, when the user moves the discharge cover **220** to close the opened dust discharging port **205***d*, the sealing member **230** may be moved toward the dust collecting case **110** together with the discharge cover **220**. At this time, the first sealing portion **232** and the second sealing portion **233** may be located to be spaced from the third sealing portion **234**.

When the sealing member **230** is moved to a position adjacent to the dust collecting case **110**, the sealing member **230** may be located at a position in which at least a part of the first sealing portion **232** or the second sealing portion **233** faces the coupling surface **201***b* of the dust collecting case **110**.

As illustrated in FIG. **10**B, the sealing member **230** may be moved together with the discharge cover **220** until being in contact with a part of the dust collecting case **110**. The sealing member **230** may be moved until the coupling surface **201***b* of the dust collecting case **110** is in contact with at least a part of the first sealing portion **232** or the second sealing portion **233**. In this state, as the discharge cover **220** is closer to the dust collecting case **110**, the first sealing portion **232** becomes closer to the third sealing portion **234**, and the second sealing portion **233** may be moved together with the connection portion **235** toward the inside of the discharge cover **220**.

As illustrated in FIG. **10**C, when the discharge cover **220** blocks the dust discharging port **205***d* and is coupled to the dust collecting case **110**, the sealing member **230** may be provided to seal each of the discharge cover **220** and the dust collecting case **110**. At this time, the sealing member **230** may be moved to the second position while being in contact with the dust collecting case **110**. At the second position, the sealing member **230** may perform a sealing operation in a state in which the first sealing portion **232**, the second sealing portion **233**, and the third sealing portion **234** are in contact with the inner surface **201***a* of the dust collecting case, the coupling surface **201***b* of the dust collecting case, and the coupling surface **227** of the discharge cover **220**, respectively.

As described above, the sealing member **230** according to one embodiment of the present invention performs the sealing operation in a state in which the first sealing portion **232** and the second sealing portion **233** are in surface contact from the inner surface **201***a* of the dust collecting case to the coupling surface **201***b*, and thus a contact surface area between the sealing member **230** and the dust collecting case **110** may be increased. Since the surface area between the sealing member **230** and the dust collecting case **110** is increased, the sealing effect may be enhanced. Therefore, it may be prevented that the sealing state is damaged by the external shock, and thus the dust in the dust collecting device **100** leaks.

Also, since the sealing member **230** has the restoring force intended to be returned from the second position to the first position, the discharge cover **220** may be easily separated from the dust collecting case **110**.

Hereinafter, modified examples of the sealing member **230** will be described.

FIGS. **11** and **12** are views illustrating a first modified example of the sealing member of FIG. **7**.

Referring to FIGS. **11** to **12**, a sealing member **240** may include a sealing portion **241**, a connection portion **246**, and a coupling portion **247**. When comparing with the sealing member **230** of FIG. **7**, the sealing member **240** is different from the sealing member **230** in a structure of the sealing portion **241**, and other structures thereof are the same as those of the sealing member **230** of FIG. **7**. Hereinafter, the sealing member **240** will be described centering on a difference from the sealing member **230** of FIG. **7**, and the repeated description will be omitted.

The sealing portion **241** may include a first sealing portion **242**, a second sealing portion **243**, a third sealing portion **244**, and a fourth sealing portion **245**. The sealing portion **241** may further include the third sealing portion **244**, when comparing with the sealing portion **231** of the sealing member **230** of FIG. **7**.

The third sealing portion **244** may be provided to extend from one side of the second sealing portion **243**. The third sealing portion **244** may be provided to extend in parallel with the first sealing portion **242**. As illustrated in FIG. **12**, the third sealing portion **244** may be provided to be in contact with an outer surface **201***c* of the dust collecting case while the discharge cover **220** is coupled with the dust collecting case **110**. Therefore, the sealing member **240** is in contact with the outer surface **201***c* of the dust collecting case other than the inner surface **201***a* and the coupling surface **201***b* of the dust collecting case, and may enhance the sealing effect.

FIGS. **13** and **14** are views illustrating a second modified example of the sealing member of FIG. **7**.

Referring to FIGS. **13** to **14**, a sealing member **250** may include a sealing portion **251**, a connection portion **255**, and a coupling portion **256**. When comparing with the sealing member **230** of FIG. **7**, the sealing member **250** is different from the sealing member **230** in a structure of the sealing portion **251**, and other structures thereof are the same as those of the sealing member **230** of FIG. **7**. Hereinafter, the sealing member **250** will be described centering on a difference from the sealing member **230** of FIG. **7**, and the repeated description will be omitted.

The sealing portion **251** may include a first sealing portion **252** and a second sealing portion **253**. When comparing with the sealing member **230** of FIG. **7**, a structure corresponding to the third sealing portion **234** which is in contact with the coupling surface **227** of the discharge cover **220** may be omitted.

As illustrated in FIG. **14**, the first sealing portion **252** and the second sealing portion **253** are in contact with the inner surface **201***a* and the coupling surface **201***b* of the dust collecting case, and thus the sealing portion **251** may perform the sealing operation. The first sealing portion **252** may be provided so that one side of the first sealing portion **252** is in contact with the inner surface **201***a* of the dust collecting case at the second position, and the other side thereof is in contact with the coupling surface **228** of the discharge cover **220**. Therefore, the sealing member **250** may seal the

dust collecting case **110** and the discharge cover **220** with a simpler structure than that of the sealing member **230** of FIG. **7**.

FIGS. **25** and **26** are views illustrating a third modified example of the sealing member of FIG. **7**.

Referring to FIGS. **25** and **26**, a sealing member **510** may have a coupling groove **511** formed at an upper surface thereof. The coupling groove **511** may be installed at the discharge cover **220** to face the coupling surface **201***b* of the dust collecting case. A first inclined surface **512***a* and a second inclined surface **512***b* may be provided at an upper surface of the sealing member **510** to have a v shape which is recessed downward. The first inclined surface **512***a* and the second inclined surface **512***b* may form the coupling groove **511**. The sealing member **510** may be formed of a material having a restoring force.

As illustrated in FIG. **26**, when the discharge cover **220** is coupled with the dust collecting case **110**, the sealing member **510** may be in surface contact with a part of a lower portion of the dust collecting case **110**. The sealing member **510** may be in surface contact with the dust collecting case **110** while deformed so that the first and second inclined surfaces **512***a* and **512***b* surrounds a part of the lower portion of the dust collecting case **110**. The sealing member **510** may be in surface contact with a lower surface of the dust collecting case **110**, an outer surface thereof connected with the lower surface, and an inner surface thereof connected with the lower surface. Therefore, a contact area between the sealing member **410** and the dust collecting case **110** may be increased, and the sealing effect may be enhanced.

Also, when the discharge cover **220** is separated from the dust collecting case **110**, the sealing member **510** may be easily separated from the dust collecting case **110** due to the restoring force. When the sealing member **510** is started to be separated from the dust collecting case **110**, the sealing member **510** may be restored to have a shape illustrated in FIG. **25** due to the restoring force, and thus may be easily separated from the dust collecting case **110**.

FIGS. **27** and **28** are views illustrating a fourth modified example of the sealing member of FIG. **7**.

Referring to FIGS. **27** and **28**, a sealing member **520** may include a body portion **521**, a contact portion **522**, and a coupling groove **523**. The body portion **521** may be installed at an upper surface of the discharge cover **220**. The contact portion **522** and the coupling groove **523** may be provided at an upper surface of the body portion **521**. The contact portion **522** may include a first contact portion **522***a* and a second contact portion **522***b*. The first contact portion **522***a* may be provided to have a shape which extends upward from an upper surface of the body portion **521**. The first contact portion **522***a* may be provided to extend at an obtuse angle with respect to the upper surface of the body portion **521**. The second contact portion **522***b* and the first contact portion **522***a* may be provided to form bilateral symmetry at the upper surface of the body portion **521**. The first and second contact portions **522***a* and **522***b* and the upper surface of the body portion **521** may form the coupling groove **523**. The coupling groove **523** may be provided as a space surrounded by the first and second contact portions **522***a* and **522***b* and the upper surface of the body portion **521**. The sealing member **520** may be formed of the material having the restoring force.

As illustrated in FIG. **28**, when the discharge cover **220** and the dust collecting case **110** are coupled with each other, the sealing member **520** may be in surface contact with a part of the lower portion of the dust collecting case **110**. When the dust collecting case **110** is moved down while being in contact with the upper surface of the body portion **521**, the sealing member **520** may be deformed so that the first and second contact portions **522***a* and **522***b* are in surface contact with the inner surface and the outer surface of the dust collecting case **110**. Therefore, when the discharge cover **220** and the dust collecting case **110** are coupled with each other, the sealing member **520** may be in surface contact with the coupling surface, the inner surface and the outer surface of the lower end of the dust collecting case **110**, and thus a sealed area may be increased. Therefore, the sealing effect of the sealing member **520** may be enhanced.

Also, when the discharge cover **220** and the dust collecting case **110** are separated from each other, the sealing member **520** may be easily separated from the dust collecting case **110** due to the restoring force. When the sealing member **520** is started to be separated from the dust collecting case **110**, the sealing member **520** may be restored to have a shape illustrated in FIG. **27** due to the restoring force, and thus may be easily separated from the dust collecting case **110**.

FIGS. **29** and **30** are views illustrating a fifth modified example of the sealing member of FIG. **7**.

Referring to FIGS. **29** and **30**, a sealing member **530** may include a contact portion **531** and a support portion **533**. The contact portion **531** may be provided to be supported by the support portion **533** and to face the lower end of the dust collecting case **110**. The contact portion **531** may be provided to have a triangular cross section. The contact portion **531** may be provided to be inserted into a coupling groove **201***d* provided at the lower end of the dust collecting case **110**. The coupling groove **201***d* may be provided at the lower end of the dust collecting case **110** to have a shape corresponding to the contact portion **531**. The sealing member **530** may be formed of the material having the restoring force.

The support portion **533** may be provided to support the contact portion **531**. The support portion **533** may be provided so that one side thereof is coupled to the discharge cover **220** and the other side thereof is coupled to the contact portion **531**. The support portion **533** may be provided to be bent a plurality of times. Therefore, as illustrated in FIG. **30**, when the dust collecting case **110** is moved down together with the contact portion **531**, the support portion **533** may be deformed while a longitudinal length thereof is reduced.

As illustrated in FIG. **30**, when the discharge cover **220** and the dust collecting case **110** are coupled with each other, the sealing member **530** may be inserted into and in surface contact with the coupling groove **201***d*. Therefore, when the discharge cover **220** and the dust collecting case **110** are coupled with each other, the sealing member **530** is in surface contact with the coupling groove **201***d* of the dust collecting case **110**, and thus the sealed area may be increased. Therefore, the sealing effect of the sealing member **530** may be enhanced.

Also, when the discharge cover **220** and the dust collecting case **110** are separated from each other, the sealing member **530** may be easily separated from the dust collecting case **110** due to the restoring force of the support portion **533**. When the sealing member **530** is started to be separated from the dust collecting case **110**, the sealing member **530** may be restored to have a shape illustrated in FIG. **29** due to the restoring force, and thus may be easily separated from the dust collecting case **110**.

FIGS. **31** and **32** are views illustrating a sixth modified example of the sealing member of FIG. **7**.

Referring to FIGS. **31** and **32**, a sealing member **540** may include a contact portion **541** and a support portion **543**. The contact portion **541** may be provided to be supported by the support portion **543** and to face the lower end of the dust collecting case **110**. The contact portion **541** may be provided to have a cylindrical shape having a hollow **541***a*. The contact portion **541** may be provided to face a coupling groove **201***e* provided at the lower end of the dust collecting case **110**. The sealing member **540** may be formed of the material having the restoring force.

The support portion **543** may be provided to support the contact portion **541**. The support portion **543** may be provided so that one side thereof is coupled to the discharge cover **220** and the other side thereof is coupled to the contact portion **541**.

As illustrated in FIG. **32**, when the discharge cover **220** and the dust collecting case **110** are coupled with each other, the sealing member **540** may provide the sealing effect while being in contact with the coupling groove **201***e*. While the contact portion **541** is pressed by being in contact with the dust collecting case **110**, the sealing member **540** may be deformed at the coupling groove **201***e* to have an elliptical shape. Therefore, a contact surface area between the contact portion **541** and the dust collecting case **110** may be increased, and thus the sealing effect thereof may be enhanced.

Also, when the discharge cover **220** and the dust collecting case **110** are separated from each other, the sealing member **540** may be easily separated from the dust collecting case **110** due to the restoring force of the contact portion **541**. When the sealing member **540** is started to be separated from the dust collecting case **110**, the sealing member **540** may be restored to have a shape illustrated in FIG. **31** due to the restoring force, and thus may be easily separated from the dust collecting case **110**.

FIGS. **33** and **34** are views illustrating a seventh modified example of the sealing member of FIG. **7**.

Referring to FIGS. **33** and **34**, a sealing member **550** may be provided in a shape which surrounds a part of an upper side of the discharge cover **220**. The sealing member **550** may be provided to have a shape which surrounds a coupling groove **220***b* formed at an upper surface of the discharge cover **220**. The coupling groove **220***b* may be formed at a position facing the dust collecting case **110** so that the dust collecting case **110** may be inserted therein. The sealing member **550** may be formed of the material having the restoring force.

As illustrated in FIG. **34**, when the discharge cover **220** and the dust collecting case **110** are coupled with each other, the sealing member **550** may be inserted into the coupling groove **220***b* together with the dust collecting case **110** while being in surface contact with the lower surface, the inner surface and the outer surface of the dust collecting case **110**. Therefore, when the discharge cover **220** and the dust collecting case **110** are coupled with each other, the sealing member **550** is in surface contact with the dust collecting case **110**, and thus the sealed area may be increased. Thus, the sealing effect of the sealing member **550** may be enhanced.

Also, when the discharge cover **220** and the dust collecting case **110** are separated from each other, the sealing member **550** may be easily separated from the dust collecting case **110** due to the restoring force of the sealing member **550**. When the sealing member **550** is started to be separated from the dust collecting case **110**, the sealing member **550** may be restored to have a shape illustrated in FIG. **33** due to the restoring force, and thus may be easily separated from the dust collecting case **110**.

Hereinafter, a dust collecting device according to another embodiment of the present invention will be described.

FIG. **15** is an exploded perspective view illustrating the dust collecting device including a dust catching member according to another embodiment of the present invention, FIG. **16** is a cross-sectional view illustrating a cross section of the dust collecting device of FIG. **15**, and FIG. **17** is a cross-sectional view illustrating a discharge cover including the dust catching member of FIG. **15**.

Referring to FIGS. **15** to **17**, a dust collecting device **101** may include the dust collecting case **110**, the discharge cover **220**, and a dust catching member **265**. When comparing with the dust collecting device **100** of FIG. **3**, the dust collecting device **101** is different from the dust collecting device **100** in the dust catching member **265**, and other structures thereof are the same as those of the dust collecting device **100** of FIG. **3**. Hereinafter, the dust collecting device **101** will be described centering on a difference from the dust collecting device **100** of FIG. **3**, and the repeated description will be omitted.

First, the dust catching member **265** may be provided at an inner surface of the discharge cover **260**. A plurality of dust catching members **265** may be installed at an inner bottom surface of the discharge cover **260**. The plurality of dust catching members **265** may be provided to be spaced at regular intervals from each other.

The dust catching member **265** may be configured with a plurality of protrusions which are provided to extend upward from the lower surface of the discharge cover **260** and to be spaced at regular intervals. The plurality of protrusions may be provided so that each cross section thereof is gradually reduced upward. Therefore, the dust catching member **265** may be provided so that a distance between the protrusions is gradually increased upward. The dust catching member **265** may be provided in a comb shape.

As illustrated in FIG. **16**, the dust catching member **265** may be provided to be located at the first dust collecting chamber **205***a* while the discharge cover **260** is coupled to the dust collecting case **110**. The dust catching member **265** may be provided so that an upper end thereof is located lower than a grill unit **170**.

The dust catching member **265** may be provided so that the dust moved with the rotating air current in the first dust collecting chamber **205***a* is caught by the plurality of protrusions. The dust catching member **265** may be provided so that the rotating air passes through spaces among the plurality of protrusions and the dust is caught by the protrusions. Therefore, the dust catching member **265** may separate the dust while minimizing obstruction of a flow of the rotating air current in the first dust collecting chamber **205***a*. Also, the dust catching member **265** may prevent the dust from being scattered in the first dust collecting chamber **205***a*.

The dust catching member **265** may be provided in a plurality of units each of which has the plurality of protrusions. The plurality of protrusions provided in each unit may be provided to have different distances and heights from each other. Therefore, the dust catching member **265** may remove the dust having various sizes.

FIG. **18** is a view illustrating the discharge cover including a first modified example of the dust catching member of FIG. **15**.

Unlike the dust catching member **265**, a dust catching member **275** may be provided in a plate shape. The dust

catching member **275** may be provided to have a rounded shape having the same curvature. Therefore, the dust catching member **275** may reduce resistance of the rotating air in the first dust collecting chamber **205***a*.

A plurality of dust catching members **275** may be provided. The plurality of dust catching members **275** may be disposed to have a predetermined distance therebetween. Therefore, the dust catching members **275** may form a passage between the dust catching members **275** through which the rotating air flows. A space formed between the dust catching members **275** may pass only the rotating air, and the dust contained in the air may be caught and separated by the dust catching members **275**.

The plurality of dust catching members **275** may form one dust catching unit. For example, the dust catching unit configured with the plurality of dust catching members **275** may be disposed on a lower surface of a discharge cover **270** to have a predetermined distance between the dust catching members **275**. As illustrated in FIG. **18**, three dust catching units each of which is configured with the plurality of dust catching members **275** may be provided to have predetermined distances among them. Three or more, or three or less dust catching units may be provided.

In one dust catching unit having the plurality of dust catching members **275**, each dust catching member **275** may be provided to have a different size. The plurality of dust catching members **275** may be provided so that sizes thereof are gradually increased from a center of the discharge cover **270** toward an edge thereof. Alternatively, the plurality of dust catching members **275** may be provided to have the same size.

FIG. **19** is a perspective view illustrating a dust collecting device including a second modified example of the dust catching member of FIG. **15**, and FIG. **20** is a view illustrating a cross section of the dust collecting device of FIG. **19**.

Referring to FIGS. **19** and **20**, when comparing with the dust catching member **265** of FIG. **17**, a dust catching member **290** is different from the dust catching member **265** in a providing position of the dust catching member **290**, and other structures thereof are the same as those of the dust catching member **265** of FIG. **17**. Hereinafter, the dust catching member **290** will be described centering on a difference from the dust catching member **265** of FIG. **17**.

The dust catching member **290** may be installed at an inner surface of the container body **201** which forms a side surface of the first dust collecting chamber **205***a*. The dust catching member **290** may be provided to extend from the inner surface of the container body **201** toward a center of the first dust collecting chamber **205***a*. The dust catching member **290** may be provided so that an upper end thereof is located lower than the grill unit **170**. A plurality of dust catching members **290** may be provided at the inner surface of the container body **201** to have a predetermined distance therebetween. Although not shown in the drawings, the plurality of dust catching members **290** may be provided to be located at different heights from each other.

Due to the above-described structure, the dust catching member **290** may separate the dust from the air rotated in the first dust collecting chamber **205***a*. Also, the dust catching member **290** may be provided so that the flow of the rotating air is not restricted by a distance between the plurality of protrusions. Therefore, dust separation efficiency of the dust collecting device **100** may be enhanced.

Referring to FIGS. **3** and **4** again, the dust collecting device **100** may further include a cyclone assembly **140**.

The cyclone assembly **140** may be provided at an inside of the dust collecting case **110**. The cyclone assembly **140** is provided to generate the rotating air current and to separate the dirt from the air due to the centrifugal force. The rotating air current is generated when the fan motor (not shown) provided in the main body **10** is driven.

The cyclone chambers **142** and **144** in which the rotating air current is generated may be provided at the inside of the dust collecting case **110**. In the cyclone chambers **142** and **144**, the dust is separated from the air due to the centrifugal force. The cyclone chambers **142** and **144** may include the first cyclone chamber **142** and the second cyclone chamber **144**.

The first cyclone chamber **142** may be formed by the grill unit **170**, a cyclone body **150**, and the dust collecting case **110**. The second cyclone chamber **144** may be formed by the cyclone body **150** and at least one cyclone **300**.

In another aspect, arrangement relationship of the dust collecting device **100** is as follows. The arrangement relationship of the dust collecting device **100** may be described through a flow of the air. When a direction in which the air introduced through the inlet **111** flows toward the outlet **112** is defined as a flowing direction X, the upper case **120** may be located at a downstream side of the flowing direction X, and the dust collecting container **200** may be located at an upstream side of the flowing direction X. The cyclone assembly **140** may be located between the upper case **120** and the dust collecting container **200**. The filter member **134** may be disposed at a downstream side of the cyclone assembly **140** in the flowing direction X to remove the remaining dust from the air that has passed through the cyclone assembly **140**. Specifically, the filter member **134** may be disposed at a downstream side of an upper cyclone body **152** in the flowing direction X to transfer the air passing through an exhaust hole **154**.

FIG. **21** is a perspective view illustrating the grill unit of FIG. **3**, FIG. **22** is a perspective view illustrating the cyclone body of FIG. **3**, FIG. **23** is a cut-away perspective view illustrating a coupling structure of the grill unit and the cyclone body of FIG. **3**, and FIG. **24** is a view of the dust collecting device taken along a line A-A' of FIG. **4**. Hereinafter, at least one cyclone **300** may be referred to as at least one dust separating part or corn. Hereinafter, the upper cyclone body **152** may be referred to as a cover. Hereinafter, the dust collecting container **200** may be referred to as a dust accommodating portion.

Referring to FIGS. **21** to **24**, the cyclone assembly **140** may include the grill unit **170** and the cyclone body **150**.

The cyclone body **150** may be disposed at the inside of the duct collecting case **110**. Also, the cyclone body **150** may be provided so that the grill unit **170** is seated thereat. The cyclone body **150** serves to guide the air discharged from the first cyclone chamber **142**, such that the air passes through the grill unit **170** and then flows to the second cyclone chamber **144**.

The cyclone body **150** may include the upper cyclone body **152** and a lower cyclone body **156**. The grill unit **170** and at least one cyclone **300** in which the second cyclone chamber **144** is formed may be seated at the lower cyclone body **156**. A guide tube **155** which guide the air passing through a grill housing **171** to be introduced into the second cyclone chamber **144** from the first cyclone chamber **142** may be formed at the upper cyclone body **152**. Also, the upper cyclone body **152** may be coupled to at least one cyclone **300** so that the air introduced through the inlet **111** is guided to at least one cyclone **300**. The upper cyclone body **152** will be described later.

A unit seating part **160** may be provided at the lower cyclone body **156** so that one end of the grill unit **170** is seated thereat. A coupling protrusion (not shown) may be formed at the unit seating part **160** so that the grill unit **170** is fixed thereto, and a coupling groove **162** corresponding to the coupling protrusion (not shown) may be formed at the grill unit **170**.

The grill unit **170** may be provided at the inside of the dust collecting case **110**. Also, the grill unit **170** may be provided to remove the dust having a predetermined size or more from the air discharged from the first cyclone chamber **142**.

The grill unit **170** may include a grill body **180** and an inlet tube **182**.

The inlet tube **182** may be provided to guide the air introduced from the inlet **111** of the suction port **220***a* to the first cyclone chamber **142**. Therefore, one end of the inlet tube **182** may be provided to be in communication with the inlet **111** of the suction port **220***a*, and the other end thereof may be provided to be in communication with the first cyclone chamber **142**.

The inlet tube **182** may include an inlet hole **170***a* which is provided at one end of an inlet tube body **182***a* to be in communication with the inlet **111**, and a guide portion **184** which is provided at the other end of an inlet tube body **182***a* to guide the air to the first cyclone chamber **142**. The guide portion **184** may extend from the inlet tube body **182***a* to be bent in a radial direction with respect to a lengthwise direction of the inlet tube body **182***a*.

The guide portion **184** may include a discharge guide surface **184***a* formed to have a curved surface so that the air guided through a first passage P**1** in the inlet tube body **182***a* is spirally discharged in a proceeding direction of the first passage P**1**. The discharge guide surface **184***a* allows a flowing direction of the air discharged through the guide portion **184** to be smoothly changed to a circumferential direction.

By such a structure, the air introduced through the suction part **21** may pass through the inlet **111**, may be introduced into the inlet tube **182** through the inlet hole **170***a*, and then may be discharged to the first cyclone chamber **142** through the guide portion **184**. The first passage P**1** is formed in the inlet tube **182**. The first passage P**1** is provided so that the air introduced into the first cyclone chamber **142** passes therethrough.

The grill body **180** is provided to remove the dust having the predetermined size or more in the first cyclone chamber **142**.

An outlet hole **170***b* provided to be in communication with the discharge port **122** may be formed at the grill body **180**. The air introduced from the first cyclone chamber **142** to the grill body **180** is discharged to an outside of the grill unit **170** through the outlet hole **170***b* provided at one end of the grill body **180**. The air discharged through the outlet hole **170***b* is introduced into the second cyclone chamber **144** through the guide tube **155**.

The grill body **180** is provided to divide the first cyclone chamber **142** from the outlet hole **170***b* or the discharge port **122** and thus to prevent the dust separated by generating the rotating air current in the first cyclone chamber **142** from passing through the first cyclone chamber **142** and then being discharged through the outlet hole **170***b* or the discharge port **122**. Specifically, a plurality of air passing holes **181** disposed to be spaced a predetermined distance, such that the dust may be prevented from passing therethrough and the air from which the dust is separated by the centrifugation may pass therethrough, may be formed at the grill body **180**.

The grill body **180** may be provided to be separated from the inlet tube **182**. In the embodiment, the grill body **180** and the inlet tube **182** may be provided to be separated from each other, and also may be integrally formed with each other. The grill body **180** may be provided to surround the inlet tube **182**. A second passage P**2** may be formed between an outer surface of the inlet tube **182** and the grill body **180**. Specifically, the grill body **180** is provided to be spaced a predetermined distance from the outer surface of the inlet tube **182**, and the second passage P**2** is formed between the outer surface of the inlet tube **182** and the grill body **180**.

The first passage P**1** which is formed in the inlet tube **182** to guide the air introduced from the inlet hole **170***a* and the second passage P**2** which is formed between the inlet tube **182** and the grill body **180** to guide the air introduced from the first cyclone chamber **142** into the grill body **180** to the outlet hole **170***b* may be formed together at the grill unit **170**. The first and second passages P**1** and P**2** may be formed in the same direction. In a different point of view, the inlet tube body **182***a* and the grill body may be disposed so that center lines thereof in a lengthwise direction coincide with each other.

Since the first and second passages P**1** and P**2** are disposed together at an inside of the grill unit **170**, a structure of the cyclone assembly **140** may be simplified. Also, since the first and second passages P**1** and P**2** are disposed at the inside of the grill unit **170** in the same direction, it is not necessary to provide separately an air tube which guides the air introduced to introduce the air from the suction part **21** to the cyclone chambers **142** and **144**, and since the air introduced from the suction part **21** may be directly introduced into the cyclone chambers **142** and **144**, passage resistance may be reduced.

The cyclone assembly **140** may include an air current forming part **166**. The air current forming part **166** is provided so that the air guided from the inlet tube **182** to the first cyclone chamber **142** may be rotated.

The air current forming part **166** is provided so that the air introduced into the first cyclone chamber **142** forms the rotating air current. The air current forming part **166** is provided at the cyclone body **150**. Also, the air current forming part **166** is provided so that the air passing through the first passage P**1** forms the rotating air current while being discharged to the guide portion **184** and introduced into the first cyclone chamber **142**. In the embodiment of the present invention, the air current forming part **166** is formed at the cyclone body **150**, but an arrangement and a shape of the air current forming part **166** may be changed variously.

The air current forming part **166** may be formed along a circumference of the grill unit **170**. That is, the air current forming part **166** is may be disposed at the cyclone body **150** along the circumference of the grill unit **170**.

The air current forming part **166** may include a first air current guide surface **167** and a second air current guide surface **168**.

The first air current guide surface **167** is a guide surface of which at least a part is formed to be concave and with which the air discharged from the inlet tube **182** is in contact, such that the air guided to the first cyclone chamber **142** is rotated in a circumferential direction centering on the grill unit **170**. That is, the first air current guide surface **167** is provided to be concave, such that a flowing direction of the air discharged to the guide portion **184** is curved in the circumferential direction. Also, the first air current guide surface **167** may be formed to have a curved surface, such that a direction of the air discharged from the guide portion

184 is smoothly changed. A shape of the first air current guide surface 167 may be modified variously.

The second air current guide surface 168 is a guide surface which is formed to be inclined toward the first cyclone chamber 142 in the circumferential direction centering on the grill unit 170. In the embodiment of the present invention, since the grill unit 170 is disposed at a lower portion of the cyclone body 150, the second air current guide surface 168 is provided to protrude downward from the cyclone body 150 in the circumferential direction centering on the grill unit 170. By such a structure, the air rotated in the circumferential direction by the first air current guide surface 167 may flow toward the first cyclone chamber 142.

Since the guide portion 184 provided at the end of the inlet tube 182 and the air passing hole 181 of the grill body 180 are provided adjacent to each other, there may be a problem in that the air discharged from the guide portion 184 is directly introduced into the air passing hole 181. To solve the problem, the grill unit 170 may further include an air current forming rib 186.

The air current forming rib 186 may be provided toward the first cyclone chamber 142 to be adjacent to the guide portion 184. By providing the air current forming rib 186, the air discharged from the guide portion 184 may be spaced from the grill body 180 and then may be introduced into the first cyclone chamber 142.

The grill unit 170 may further include a flange grill part 188.

The flange grill part 188 may be provided to divide the first cyclone chamber 142 from the first dust collecting chamber 205*a*. The flange grill part 188 may be formed to extend from the outer surface of the inlet tube 182 to prevent the dust collected in the first dust collecting chamber 205*a* from flowing back toward the first cyclone chamber 142.

The flange grill part 188 may have a grill shape to prevent movement of the dust. Also, the flange grill part 188 may be in contact with a lower portion of the grill body 180 to prevent the dust separated by the centrifugation from being moved to the second passage P2. The plurality of air passing holes 181 may also be formed at flange grill part 188, like the grill body 180.

Further, the flange grill part 188 may be provided to be inclined toward the first dust collecting chamber 205*a*, such that the air is prevented from flowing back from the first dust collecting chamber 205*a* toward the first cyclone chamber 142. That is, since the flange grill part 188 has a flange shape which is inclined toward the first dust collecting chamber 205*a* between the first cyclone chamber 142 and the first dust collecting chamber 205*a*, the air may be effectively prevented from flowing back from the first dust collecting chamber 205*a*.

The cyclone assembly 140 may further include the second cyclone chamber 144.

The second cyclone chamber 144 may be disposed in a radial direction of the first cyclone chamber 142. The second cyclone chamber 144 may be provided at an inside of at least one cyclone 300. Further, the second cyclone chamber 144 may be provided to perform secondarily the centrifugation with respect to the air from which the dust is primarily separated by the first cyclone chamber 142. Specifically, the air introduced from the first cyclone chamber 142 into the grill unit 170 flows to the at least one cyclone 300 through the guide tube 155 of the cyclone body 150, and then is secondarily separated from the dust through the centrifugation in the second cyclone chamber 144 provided in the at least one cyclone 300.

The at least one cyclone 300 may be disposed to separate the dust from the air introduced through the inlet 111.

The at least one cyclone 300 may be disposed at the dust collecting case 110.

The at least one cyclone 300 may be disposed at the inside of the dust collecting case 110 to separate the dust from the air introduced through the inlet 111. Specifically, the at least one cyclone 300 may be disposed along a circumference of the lower cyclone body 156.

The second cyclone chamber 144 may be formed at an inside of the at least one cyclone 300. In the second cyclone chamber 144, the dust is centrifugally separated from the air.

The at least one cyclone 300 may include an air introducing hole 301 and a dust discharging hole 302. The air introducing hole 301 may be provided so that the air introduced through the inlet 111 is introduced into the at least one cyclone 300. The dust discharging hole 302 may be provided to be opened toward the dust collecting container 200. Alternatively, the dust discharging hole 302 may be provided to be in communication with the dust collecting container 200. Also, the air introducing hole 301 may be located at an upper portion in a lengthwise direction L of the at least one cyclone 300. The dust discharging hole 302 may be located at a lower portion in the lengthwise direction L of the at least one cyclone 300. That is, the dust discharging hole 302 may be provided tougher with the air introducing hole 301 in the lengthwise direction L of the at least one cyclone 300 so that the dust separated from the air introduced through the air introducing hole 301 is discharged therethrough.

In another aspect, the at least one cyclone 300 may include a body 303, the air introducing hole 301 and the dust discharging hole 302. The body 303 forms an exterior of the at least one cyclone 300, and the air introducing hole 301 and the dust discharging hole 302 may be formed at both ends of the body 303, respectively.

The air introducing hole 301 may be relatively wide, and the dust discharging hole 302 may be relatively narrow. That is, a width of the air introducing hole 301 may be larger than that of the dust discharging hole 302. This is to maximize dust separation efficiency of the at least one cyclone 300. That is, since the width of the dust discharging hole 302 is formed smaller than that of the air introducing hole 301, the centrifugal force of the air containing the dust, i.e., the contaminant air may be increased. A greater centrifugal force may be generated at the dust discharging hole 302 having the relatively small width.

The body 303 may include at least one of a flat surface and a curved surface. The curved surface may include at least one of a curved surface which is convex in an outer direction of the at least one cyclone 300 and a curved surface which is concave in an inner direction of the at least one cyclone 300.

The at least one cyclone 300 may have a truncated cone shape. The air introducing hole 301 may be provided at one end of the at least one cyclone 300, and the dust discharging hole 302 may be provided at the other end thereof. A diameter of the air introducing hole 301 may be greater than that of the dust discharging hole 302. When the at least one cyclone 300 may have the truncated cone shape, the body 303 may have the flat surface. However, a shape of the at least one cyclone 300 is not limited to the truncated cone shape.

The at least one cyclone 300 may have a symmetric shape with respect to an axis S of symmetry which is in parallel with the lengthwise direction L of the at least one cyclone 300.

A cleaner **1** according to one embodiment of the present invention may include a canister type, an up-right type and a handy type, but the present invention is not limited thereto.

In this specification, exemplary embodiments of the present invention have been classified into the first, second and third exemplary embodiments and described for conciseness. However, respective steps or functions of an exemplary embodiment may be combined with those of another exemplary embodiment to implement still another exemplary embodiment of the present invention.

The invention claimed is:

1. A cleaner comprising a dust collecting device for separating dust from air, wherein the dust collecting device comprises:

a dust collecting case comprising a dust discharging port configured to collect dust and discharge the collected dust when opened;

a discharge cover coupled to one side of the dust collecting case and configured to open and close the dust discharging port; and

a sealing member comprising:

a first portion provided to extend along an inner surface of the dust collecting case when the dust discharging port is closed,

a second portion extending from the first portion and extending along a coupling surface of the dust collecting case when the dust discharging port is closed, and

a third portion configured to contact the discharge cover,

wherein the coupling surface is configured to move the second portion to contact the third portion to create a seal between the discharge cover and the dust collecting case when the dust discharging port is closed.

2. The cleaner of claim **1**, wherein the sealing member comprises:

a sealing portion, comprising the first portion, the second portion, and the third portion, provided to be in surface contact with the inner surface and the coupling surface; and

a connection portion connected to the sealing portion and configured to vary a position ofthe sealing portion.

3. The cleaner of claim **2**, wherein:

the first portion is configured to extend from the connection portion and provided to be in contact with an inner surface of the dust discharging port and thus to be sealed; and

the second portion is configured to extend from one side of the first portion and provided to be in contact with the coupling surface and thus to be sealed.

4. The cleaner of claim **3**, wherein:

the first portion is formed to have a first angle with respect to the second portion, and

the first angle is smaller than 90°.

5. The cleaner of claim **3**, wherein the third portion is configured to extend from one side of the connection portion and provided to be in contact with the discharge cover at a lower portion of the first portion and configured to be sealed.

6. The cleaner of claim **2**, wherein the sealing member further comprises a coupling portion configured to extend from one side of the connection portion and provided to be coupled to an inside of the discharge cover.

7. The cleaner of claim **6**, wherein the coupling portion is provided so that the sealing member is coupled to and separated from the discharge cover.

8. The cleaner of claim **1**, wherein the sealing member is formed of a material having a restoring force.

9. The cleaner of claim **3**, wherein:

the sealing member is configured with the second portion located between the dust collecting case and the discharge cover while the dust collecting case and the discharge cover are coupled to each other, and

at least a part of the second portion is located at an outside of the discharge cover while the dust collecting case and the discharge cover are separated from each other.

10. A dust collecting device applied to a cleaner, the device comprising:

a dust collecting case comprising a dust discharging port configured to discharge dust collected within the dust collecting case when opened;

a discharge cover coupled to one side of the dust collecting case and configured to open and close the dust discharging port; and

a sealing member installed along a surface in which the dust collecting case faces the discharge cover,

wherein:

the sealing member comprises:

a first portion extending along an inner surface of the dust collecting case when the dust discharging port is closed,

a second portion extending from the first portion and extending along a coupling surface of the dust collecting case when the dust discharging port is closed, and

a third portion configured to contact the discharge cover, and

the coupling surface is configured to move the second portion to contact the third portion to create a seal between the dust collecting case and the discharge cover.

11. The device of claim **10**, wherein the sealing member comprises:

a sealing portion, comprising the first portion, second portion, and the third portion, provided to be in surface contact with the inner surface of the dust discharging port and the coupling surface of the dust collecting case; and

a connection portion connected in a manner that the sealing portion is able to be moved to a first position and a second position.

12. The device of claim **11**, wherein:

in the sealing member, the sealing portion is located at the first position while the dust collecting case and the discharge cover are separated from each other, and

the sealing portion is located at the second position to seal the dust collecting case and the discharge cover while the dust collecting case and the discharge cover are coupled to each other.

13. The device of claim **11**, wherein the sealing portion comprises:

the first portion is configured to extend from the connection portion and provided to be in contact with an inner surface of the dust discharging port and thus to be sealed; and

the second portion is configured to extend from one side of the first portion and provided to be in contact with the coupling surface and thus to be sealed.

14. The device of claim **13**, wherein:

the first portion is formed to have a first angle with respect to the second portion, and

the first angle is smaller than 90°.

15. The device of claim **11**, wherein the sealing member further comprises a coupling portion configured to extend

from one side of the connection portion and provided to be coupled to an inside of the discharge cover.

16. The device of claim **13**, wherein the third portion is configured to extend from one side of the connection portion and provided to be in contact with the discharge cover at a lower portion of the first portion and thus to be sealed.

17. The device of claim **10**, wherein the sealing member has a restoring force.

18. The device of claim **17**, wherein the sealing member is configured to be in surface contact with the inner surface and the coupling surface while a shape of the sealing member is deformed due to coupling between the dust collecting case and the discharge cover.

19. A cleaner comprising a dust collecting device for separating dust from air, wherein:

the dust collecting device comprises:

a dust collecting case comprising a dust discharging port configured to collect dust and discharge the collected dust when opened;

a discharge cover coupled to one side of the dust collecting case and configured to open and close the dust discharging port; and

a sealing member comprising:

a first portion configured to be in surface contact along a coupling surface of the dust collecting case when the dust discharging port is closed,

a second portion extending from the first portion and extending along a coupling surface of the dust collecting case when the dust discharging port is closed, and

a third portion configured to contact the discharge cover, wherein the coupling surface is configured to move the second portion to contact the third portion to create a seal between the dust collecting case and the discharge cover,

the sealing member has a restoring force; and

when the dust discharging port is switched from an opened state to a closed state, a shape of the sealing member is deformed to seal the dust collecting case and the discharge cover.

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